158-461

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TRANSCRIPT OF RECORD.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1894.

No. 314.

THE LEHIGH VALLEY RAILROAD COMPANY,
APPELLANT,

vs.

FRANCIS KEARNEY AND MARY F. TRONSON.

APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR
THE DISTRICT OF NEW JERSEY.

FILED OCTOBER 8, 1891.

(14,881.)

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1 Know all men by these presents that we, The Lehigh Valley Railroad Company, as principal, and Charles Hartshorne, of Merion, Pennsylvania, and E. P. Wilbur, of South Bethlehem, Pennsylvania, as sureties, are held and firmly bound unto Francis Kearney and Mary F. Tronson in the full and just sum of twelve thousand and five hundred dollars ($12,500) and interest from the 25th day of September, 1890, to be paid to the said Francis Kearney and Mary F. Tronson, their certain attorney, executors, administrators, or assigns; to which payment, well and truly to be made, we bind ourselves, our successors, heirs, executors, and administrators, jointly and severally, by these presents.

Sealed with our seals and dated this fourth day of November, in the year of our Lord one thousand — hundred and ninety.

Whereas lately, at a regular term of the circuit court of the United States for the district of New Jersey, in a suit depending in said court between Francis Kearney and Mary F. Tronson, complainants, and The Lehigh Valley Railroad Company, defendant, a decree was rendered against the said Lehigh Valley Railroad Company in the sum of six thousand two hundred and thirty-five dollars and fifty-two cents ($6,235.52), and the said Lehigh Valley Railroad Company having obtained an order of appeal and filed a copy thereof in the clerk's office of the said court to reverse the decree in the aforesaid suit, and a citation directed to the said Francis Kearney and Mary F. Tronson, citing and admonishing them to be and appear at a Supreme Court of the United States to be holden
2 at Washington on the second Monday of October next:

Now, the condition of the above obligation is such that if the said Lehigh Valley Railroad Company shall prosecute said appeal to effect and answer all damages and costs if it fails to make its plea good, then the above obligation to be void; else to remain in full force and virtue.

LEHIGH VALLEY RAILROAD COMPANY,
By CHAS. HARTSHORNE, *Vice-President.* [L. S.]
Attest: JNO. R. FANSHAWE, *Secretary.*
CHAS. HARTSHORNE. [L. S.]
E. P. WILBUR. [L. S.]

Sealed and delivered in presence of—
D. G. BAIRD.
F. H. JANVIER.

Approved by—
EDW. T. GREEN, *Judge.*

November 4th, 1890.

(Endorsed:) United States circuit court, district of New Jersey. In equity. The Lehigh Valley Railroad Company, appellant, *vs.* Francis Kearney and Mary F. Tronson, appellees. Bond on appeal. Filed November 4, 1890.

3 United States Circuit Court, District of New Jersey. In Equity.

THE LEHIGH VALLEY RAILROAD COMPANY, Appellant,
vs.
FRANCIS KEARNEY and MARY F. TRONSON, Appellee-.

The petition of The Lehigh Valley Railroad Company, the appellant in the above-stated cause, respectfully shows that your petitioner finds itself aggrieved by a final decree made in the circuit court of the United States for the third circuit and district of New Jersey, bearing date the twenty-fifth day of September, A. D. eighteen hundred and ninety, in a cause therein depending, wherein Francis Kearney and Mary F. Tronson were complainants and the said The Lehigh Valley Railroad Company is defendant, and hereby appeals therefrom to the Supreme Court of the United States.

Your petitioner therefore prays that the said final decree may be reversed, set aside, and for nothing holden, and that your petitioner may have such relief and decree in the premises as to your honorable court may seem meet.

ANDREW McCALLUM,
Solicitor, &c.

(Endorsed:) United States circuit —, district of New Jersey. In equity. The Lehigh Valley Railroad Company, appellant, *vs.* Francis Kearney and Mary F. Tronson, appellees. Petition of appeal. Andrew McCallum, solicitor. Allowed November 4, 1890. Edw. T. Green, J. Service acknowledged Nov. 17, 1890, for Francis Kearney & Mary F. Tronson. Elwood C. Harris, sol'r. Filed November 4, 1890. S. D. Oliphant, clerk.

4 By the Honorable Edward T. Green, one of the judges of the circuit court of the United States for the district of New Jersey.

To Francis Kearney and Mary F. Tronson:

Whereas the Lehigh Valley Railroad Company has lately appealed to the Supreme Court of the United States from a decree lately rendered in the circuit court of the United States for the district of New Jersey, made in favor of you, the said Francis Kearney and Mary F. Tronson, and has filed the security required by law, you are therefore hereby cited to appear before the said Supreme Court, at the city of Washington, on the second Monday of October next, to do and receive what may appertain to justice to be done in the premises.

Given under my hand, at Trenton, in said district, this fourth day of November, A. D. 1890.

EDW. T. GREEN, *J.*

4½ [Endorsed:] Supreme Court of the United States. The Lehigh Valley Railroad Company, appellant, *vs.* Francis Kearney and Mary F. Tronson, appellees. Citation. Service of within citation acknowledged this November 17, 1890, for Francis Kearney and Mary F. Tronson, appellees. Elwood C. Harris, sol'r.

5 United States Circuit Court, District of New Jersey.

FRANCIS KEARNEY and MARY F. TRONSON *vs.* THE LEHIGH VALLEY RAILROAD COMPANY.	In Equity.

Bill of Complaint.

(Filed March 15, 1883.)

In the Circuit Court of the United States for the District of New Jersey.

To the honorable the judges of the circuit court of the United States for the district of New Jersey, sitting in equity:

Francis Kearney and Mary F. Tronson, executrix of the last will of Luke F. Tronson, deceased, both of the city of Newark, in the State of New Jersey, and citizens of the State of New Jersey, bring this their bill of complaint, against the Lehigh Valley Rail-
6 road Company, a corporation formed under the laws of Pennsylvania, and doing business in the State of New Jersey and elsewhere; and thereupon, your orators complain and say that heretofore Francis Kearney and Luke F. Tronson, being then citizens of the United States, and residents of the State of New Jersey, were the original and first and joint inventors of certain new and useful improvements in spark-arresters for locomotives, fully described in the letters patent hereinafter mentioned, and which had not been known or used before their said invention thereof; and that the said Francis Kearney and Luke F. Tronson did, on the 11th day of April, 1871, upon due application therefor, obtain letters patent of the United States for said invention, in due form of law, under the seal of the Patent Office of the United States, signed by the Secretary of the Interior and countersigned by the Commissioner of Patents of the United States, bearing date the 11th day of April, 1871, and numbered 113,528, whereby there was granted and secured to the said Francis Kearney and Luke F. Tronson, their executors, administrators or assigns, for the term of seventeen years from and after the date of said letters patent, the full and exclusive right and liberty of making, using and vending to others, to be used, the said invention and improvements, which said letters patent are now remaining of record in the Patent Office of the United States.

And your orators further show unto your honors that the said Francis Kearney, one of your orators, and the said Luke F. Tronson, for good and lawful cause surrendered said letters patent to the Commissioner of Patents; and having made due application therefor and having in all things complied with the acts of Congress, in such cases made and provided for, did, on the 10th day of December, 1872, obtain new letters patent therefor, being for the same invention, for the residue of said term; and which were marked "reissue," No. 5184, and dated the 10th day of December, 1872, and were issued in due form of law, under the seal of the Patent Office of the United States, signed by the Secretary of the Interior 7 and countersigned by the Commissioner of Patents, as will appear by the last-mentioned letters patent now remaining of record in the Patent Office; a duly certified copy whereof your orators pray leave to refer to, as a part of this their bill.

And your orators further show unto your honors, that thereafter and on the 9th day of November, 1877, the said Luke F. Tronson departed this life, leaving a widow, your orat*or*, Mary F. Tronson, and three children, and leaving a will, and upon due and proper application and proceeding of law said will was admitted to probate, and your said orat*or*, Mary F. Tronson, the executrix named in said will, was duly authorized to take upon herself the administration of the estate of the said Luke F. Tronson, under said will as will more fully appear by the certificate of administration granted to your orat*or*, Mary F. Tronson, and a copy of said will in court to be produced.

And your orators show unto your honors that by virtue of the premises and said will they became, and now are, the sole and exclusive owners of the said letters patent, hereinbefore recited, and of the inventions therein described, and of all the rights and privileges granted and secured thereby. And that your orator, Francis Kearney, and the said Luke F. Tronson, before his death, were at great expense and trouble in and about said invention, for the purpose of having the same manufactured and tested, and used, and making the same profitable to themselves and useful to the public, and that said invention is of great benefit and advantage.

Yet the defendant, well knowing the premises and the rights secured to your orators aforesaid, but continuing to injure your orators and deprive them of their benefits and advantages, which might and otherwise would accrue to them from said invention, after the issuing of said letters patent, and before the commencement of this suit, has made and used, and caused to be made and used, spark-arresters for locomotives, at Jersey City, in said district of New 8 Jersey, and at other places in the district of New Jersey, and divers other parts of the United States. And that said manufacture and use of spark-arresters for locomotives has been and is without the license or consent, and against the will of your orators, and in violation of their rights, and in infringement of the aforesaid letters patent; and that said unlawful acts and infringements have been committed by the defendant with the full knowledge of the rights of your orators, and in defiance of their rights; and that said defendant, since the issuing and reissuing of said letters patent, as aforesaid, and before the commencement of this suit, has manufactured spark-arresters for locomotives, or caused them to be manufactured, under the direction of its officers and workmen, and has on hand now, and is using in the district of New Jersey, spark-arresters for locomotives, made according to, and employing and containing and embodying the invention and improvement, and substantial and material parts of the invention described and claimed in said letters patent; and that said defendant is threatening to cause to be made and used the said spark-arresters, for locomotives, to the injury and damage of your orators.

And your orators further show unto your honors, on information and belief, that said defendant has made a large number of said spark-arresters for locomotives, and used the same, and *have* a large number on hand, which *they are* using, and *have* realized large profits and advantages therefrom; but to what extent and how much, exactly, your orators do not know, and pray a discovery thereof; and your orators say that the use of said invention, by said defendant, and its preparation for and avowed determination to continue the same, and its other aforesaid unlawful acts, in disregard and defiance of the rights of your orators, have the effect to encourage and induce others to venture to infringe said patents, in disregard of your orators' rights.

And your orators further say, that they have caused notice to be
given to said defendant of said infringements, and the rights
9 of your orators in the premises, and requested it to desist
and refrain therefrom; but it has disregarded said notice
and request, and refused to desist from said infringement, in disregard of your orators' aforesaid rights.

And forasmuch as your orators can have no adequate relief except in this court, to the end, therefore, that the said defendant may, if it can, show why your orators should not have the relief hereby prayed, and may upon corporal oath and according to its best and utmost knowledge, remembrance, information and belief, full, true, direct and perfect answers make to the premises, and to all the several matters hereinbefore stated and charged, as fully and particularly as if severally and separately interrogated as to each and every of said matters, and may be compelled to account for and pay to your orators the profits by it acquired, and the damages suffered by your orators from the aforesaid unlawful acts.

And your orators pray that said defendant, its officers, servants, agents, attorneys and workmen, and each and every of them, may be restrained and enjoined provisionally and perpetually by the order and injunction of this honorable court from directly or indirectly making, constructing, using, vending, delivering, working, or putting into practice, operation or use, or in anywise counterfeiting or imitating the said invention, or any part thereof, or any spark-arresters for locomotives made in accordance therewith, or like or similar to those which it has heretofore made and used; and that the said defendant may be decreed to pay the costs of this suit, and that your orators may have such further relief, or such other relief, as to this honorable court shall seem meet, and as shall be agreeable to equity.

May it please your honors to grant unto your orators the writ of injunction, as well provisional as perpetual, issuing out of and under the seal of this honorable court, commanding, enjoining and restraining the said defendant, The Lehigh Valley Railroad Company, and its officers, servants, agents, attorneys and workmen, and each and every of them, as is hereinbefore in that behalf prayed.

10 May it please your honors to grant unto your orators the writ of subpœna issuing out of and under the seal of this honorable court, directed to the said defendant, The Lehigh Valley Railroad Company, commanding it, by a certain day and under a certain penalty, to be and appear in this honorable court, then and there to answer the premises, and to stand to and abide such order and decree as may be made against it.

And your orators will ever pray, &c.

FRANCIS KEARNEY.
MARY F. TRONSON,
Executrix, &c.

COCHRANE & MALCOMSON,
Compl's' Sol'rs.
A. BELL MALCOMSON, Jr.,
Counsel for Compl'ts.

United States of America, } ss:
District of New Jersey, }

On this twenty-ninth day of January, 1883, before me personally appeared Francis Kearney and Mary F. Tronson, the above-named complainants, who, being by me first duly sworn, depose and say that they have read the foregoing bill of complaint subscribed by them and know the contents thereof, and that the same is true of their own knowledge, except as to the matters therein stated on information and belief, and as to these matters they believe it to be true.

FRANCIS KEARNEY.
MARY F. TRONSON.

Subscribed and sworn to before me this twenty-ninth day of January, 1883.

ARAM G. SAYRE,
[L. S.] *Notary Public, Newark, N. J.*

11 *Plea in Abatement.*

(Filed June 1, 1883.)

The plea of the Lehigh Valley Railroad Company to the bill of complaint of Francis Kearney and Mary F. Tronson, complainants.

The defendant by protestation, not confessing or acknowledging all or any of the matters and things in said complainants' bill mentioned to be true, in such manner and form as the same are therein or thereby set forth and alleged, does plead thereunto, and for plea says:

That at the time this suit was commenced, and prior thereto, the said complainants, Francis Kearney and Mary F. Tronson, were not the sole and exclusive owners of the letters patent set forth in the bill of complaint, but that the said patent was then owned by the complainants jointly with one John H. Immen, of Newark, in the State of New Jersey, each of said parties having an equal undivided one-third interest in said letters patent, and this the said defendant is ready to verify.

Wherefore, the defendant prays the judgment of the court whether it ought to be compelled to make any answer to said bill of complaint, and that it may be hence dismissed with its reasonable costs.

ANDREW McCALLUM,
Solicitor for Defendant.

I certify that in my opinion the above plea is well founded in point of law.

ANDREW McCALLUM.

STATE OF PENNSYLVANIA, *County of Philadelphia,* } *ss:*

H. Stanley Goodwin, being duly sworn, deposes and says that he
is the general superintendent of The Lehigh Valley Railroad
12 Company, defendant in the above suit; that the said plea is
not interposed for delay, and that it is true in point of fact.

H. STANLEY GOODWIN.

Sworn to and subscribed before me this twenty-ninth day of May, 1883.

WM. C. ALDERSON,
Notary Public.

Replication.

(Filed July 7, 1883.)

The replication of Francis Kearney and Mary F. Tronson, complainants, to the plea of The Lehigh Valley Railroad, defendant.

These repliants, saving and reserving unto themselves all and all manner of benefit and advantage of exception which may be had or taken to the manifold insufficiencies of the said plea, for replication thereto, say that they will aver, maintain, and prove their said bill of complaint to be true, certain and sufficient in law to be answered unto, and that the said plea of the said defendant is uncertain, untrue and insufficient to be replied unto by these repliants. Without this, that any other matter or thing whatsoever in the said plea contained, material or effectual in the law to be replied unto, and not herein and hereby well and sufficiently replied unto, confessed or avoided, traversed or denied, is true. All which matters and things these repliants are and will be ready to aver, maintain, and prove, as this honorable court shall direct, and humbly pray as in and by their said bill they have already prayed.

COCHRANE & MALCOMSON,
Complainants' Solicitors.

13 *Stipulation to Take Testimony on Plea.*

(Filed July 24, 1883.)

John Cochrane. A. Bell Malcomson, Jr.

Offices of Cochrane & Malcomson, counsellors-at-law and advocates in patent causes (Vanderbilt building), 132 Nassau street.

NEW YORK, *July* 21, 1883.

KEARNEY *et al.*
vs.
LEHIGH VALLEY R. R.

It is hereby agreed that the testimony in this case, on issues joined, be taken for both sides, at the office of McCarter & Williamson, at Newark, N. J., on the 1st day of September, 1883, at 10 o'clock a. m., and that the cause shall go upon the calendar for the September term.

A. McCALLUM, *Solicitor for Def'd't.*
COCHRANE & MALCOMSON,
Solicitor- for Comp'ts.

Testimony.

(Filed September 3, 1883.)

Testimony taken in the above-entitled cause, pursuant to an agreement of counsel, a copy of which is hereto annexed, this first day of September, in the year eighteen hundred and eighty-three, before John R. Hardin, a notary public, of the State of New Jersey, in the presence of Francis Kearney, *per personam*, and Oliver Drake, of counsel with complainants, and Andrew McCallum, of counsel with the defendant.

14 Counsel for defendant offers in evidence the following written instruments:

A power of attorney and acknowledgment of joint ownership in letters patent number 113,538, granted to Francis Kearney and Luke F. Tronson, dated April 11, 1871, for improvements in spark-arresters for locomotives, instrument being dated Newark, April 10, 1873, and signed by F. Kearney and Luke F. Tronson, and recorded in United States Patent Office, July 2, 1873, in Liber V 16, page 289, of Transfers of Patents. Said instrument is marked Defendant's Exhibit No. 1, Kearney & Tronson's acknowledgment of John H. Immen's joint ownership and title. John R. Hardin, notary public, N. J.

Assignment of Immen's interest in said patent from John H. Immen to William G. Annan, dated April 28, 1874. Recorded April 30, 1874, in Liber V 17, page 246, of Transfers of Patents, and marked Defendant's Exhibit No. 2, of Immen's assignment to Annan. John R. Hardin, notary public, N. J.

Reassignment of said interest in said patent from William G. Annan to John H. Immen, dated June 22, 1875. Recorded in Liber W 29, page 198, of Transfers of Patents, marked Defendant's Exhibit No. 3, of reassignment to Immen. John R. Hardin, notary public, N. J.

Counsel for defendant, having asked Mr. Francis Kearney if that was his signature to Exhibit No. 1, he acknowledged that it was.

JOHN H. IMMEN, a witness for the defence, being sworn, saith—

That he is 52 years of age, and resides in Newark, N. J., and is in the machinery business.

Quest. Do you know the complainants in this case, or either of them?

Ans. I do.

Quest. Did you know the late Mr. Luke F. Tronson?

Ans. I did.

Quest. Are you familiar with his handwriting, and also with that of Francis Kearney?

Ans. I am with both.

Quest. Please examine Defendant's Exhibit No. 1, now shown you, and state if the signatures thereto are that of the said Francis Kearney and Luke F. Tronson.

Ans. I saw them sign that instrument.

Quest. Are you the John H. Immen mentioned in said instrument?

Ans. I am.

Quest. Was it signed in your presence on the date thereof?

Ans. It was.

Quest. Do you know Mr. William G. Annan, of the city of New York?

Ans. I do.

Quest. Please examine Defendant's Exhibit No. 2, and state if the signature of John H. Immen thereto is in your handwriting.

Ans. I acknowledge that to be my signature.

Quest. Please examine Defendant's Exhibit No. 3, and state, if you know, in whose handwriting it is, and if the signature thereto is genuine.

Ans. That instrument is wholly in the handwriting of Mr. William G. Annan, and his signature is known to me to be genuine.

Cross-examined by Mr. DRAKE:

Quest. Have you any other paper or was any other paper executed at the time or prior to the paper marked Defendant's Exhibit No. 1, conveying to you any interest in the patent in suit?

(Objected to by defendant's counsel as immaterial.)

Ans. I have no other paper, and none, no one, conveying any interest.

Quest. Was there any agreement, written or otherwise, entered into between you and Messrs. Kearney and Tronson other than that marked Defendant's Exhibit No. 1?

(Same objection by defendant's counsel.)

Ans. There was an agreement or contract made by Kearney and Tronson.

16 Quest. When was that agreement made and where is it?

(Same objection.)

Ans. The agreement was made the fifth of April, in the year eighteen hundred and seventy-two.

At this time a telegram was received by counsel for defendant, from A. Bell Malcolmson, attorney of record for complainants, stating that he would be present in half an hour and to wait further proceedings.

Mr. Malcolmson appeared and declined to go on, stating that he had been out of town and was under the impression that the examination was at eleven o'clock, instead of ten; that feeling he might not be here promptly at eleven, he telegraphed asking that the examination should wait for his arrival; that he is now willing to commence the examination in this case and offers counsel to do so, and refuses to accept as a part of the record in this case anything that has been written down before his arrival.

Counsel for defendant says that the testimony for defendant on the issue joined has been all taken, and if counsel for complainant has no further questions to ask the record will be closed.

Counsel for complainant states that if the foregoing means that counsel for defendant intends to attempt to use any matter written down by the person now writing this as testimony in this case and does not propose to now commence examination and begin a record in the presence of counsel for both parties as stipulated between counsel for respective parties, then he will disown the stipulation as to the taking of testimony here today, and claim that such writing is not in any sense testimony for either party taken in good faith under and in pursuance of such stipulation.

Counsel for defendant states that he has got through with the testimony-in-chief for defendant under the issue joined, and has asked the counsel for complainant to cross-examine the witness if he desires to do so. He now states that he is ready to attend the taking of any testimony on behalf of the complainant, and asks counsel
17 for complainant if he proposes taking any such testimony.

Counsel for complainant states that the counsel for defendant has not answered his question, which is: "Will you now commence the examination and taking of testimony in this case, as agreed between us at the time we personally conversed in relation to the matter and made the arrangement to meet here and take such testimony, or do you insist upon attempting to use matter which has been written down in my absence under your individual direction?" Until this question is answered I have nothing further to say, and know nothing about any testimony or any witnesses to cross-examine.

Counsel for defendant states that he has already taken the testimony for the defendant as agreed upon, and does not propose to take it a second time, and will submit the same to the court as the hearing of the case.

JOHN H. IMMEN.

Sworn — and subscribed before me this first day of September, A. D. 1883.

[L. S.]

JOHN R. HARDIN,
Notary Public, N. J.

Copy of Telegram.

SEPTEMBER 1ST, 1883.

Received at Earey's, 180 and 182 Market street.
Dated New York 1.

To Andrew McCallum, care Williamson & McCarter:

I will be with you in half an hour; wait.

A. BELL MALCOMSON.

Offices of Cochrane & Malcomson, counsellors-at-law and advocates in patent causes (Vanderbilt building), 132 Nassau street.

NEW YORK, *July 21st*, 1883.

KEARNEY *et al.*
vs.
LEHIGH VALLEY R. R.

18 It is hereby agreed that the testimony in this case, on issue joined, be taken for both sides at the office of McCarter & Williamson, at Newark, N. J., on the 1st day of September, 1883, at 10 o'clock a. m., and that the cause shall go upon the calendar for the September term.

(Signed) A. McCALLUM,
Solicitor for Defendant.
COCHRANE & MALCOMSON,
Solicitors for Complainants.

810 Broad St.

UNITED STATES OF AMERICA, }
District of New Jersey, } *ss:*

I, John R. Hardin, a notary public of the State of New Jersey, and duly qualified under the laws of the United States to take depositions for use in the courts of the United States, do hereby certify that on the day named in the depositions hereto annexed, I was attended at Newark, New Jersey, by the counsel and witness aforesaid. That the said witness was duly sworn and examined, and the deposition was reduced to writing and read to the witness, and by him subscribed in my presence; and that exhibits, on behalf of the defendant, Nos. 1, 2 and 3 were introduced in evidence in said cause.

In testimony whereof, I have hereto set my hand and notarial seal, this first day of September, A. D. eighteen hundred and eighty-three.

JOHN R. HARDIN,
[SEAL.] *Notary Public, N. J.*

DEFENDANT'S EXHIBITS.

DEFENDANT'S EXHIBIT NO. 1, KEARNEY & TRONSON'S ACKNOWLEDGMENT OF JOINT OWNERSHIP AND TITLE.

To whom it may concern:

19 This certifies that John H. Immen is fully authorized and empowered to make any contract with the Central Railroad of New Jersey, that may be binding on our part, for the sale of the patent right on spark-arrester, as secured to us by letters patent No. 113,528, dated April 11th, 1871, and reissue No. 5184, dated December 10th, 1872, he having one-third equal interest with ourselves in the said patent.

F. KEARNEY.
LUKE F. TRONSON.

Newark, April 10th, 1873.

Received for record July *July* 2d, 1873, and recorded in Liber V 16, page 289, of Transfers of Patents.

In testimony whereof, I have caused the seal of the Patent Office to be hereunto affixed.

[L. S.] J. M. THACHER,
Acting Commissioner.

Ex'd: R. H. E.

DEFENDANT'S EXHIBIT NO. 2, OF IMMEN'S ASSIGNMENT TO ANNAN.

Assignment.

Whereas, Francis Kearney and Luke F. Tronson, of Newark, New Jersey, did obtain letters patent of the United States of America, for certain improvements in spark-arresters for locomotives, which letters patent bear date the tenth day of December, eighteen hundred and seventy-two, and are numbered 5184, reissue; original patent granted April 11, 1871, and surrendered;

And whereas, on April 10, 1873, said Kearney and Tronson sold and assigned one-third of said patent to me, which assignment is recorded in Liber V 16, page 289, of Transfers of Patents; and whereas, it is my intention to transfer my interest to William G. Annan, he being desirous of acquiring an interest therein:

20 Now, this indenture witnesseth, that for and in consideration of the sum of one hundred and fifty dollars, to me, John H. Immen, in hand paid, the receipt of which is hereby acknowledged, I have assigned, sold, and set over, and do hereby assign, sell, and set over, unto the said William G. Annan, of New York, all the right, title, and interest which I have in and to the said invention, as secured to us by said letters patent.

The same to be held and enjoyed by the said William G. Annan for his own use and behoof, and for the use and behoof of his legal representatives, to the full end of the term for which said letters patent are granted, as fully and entirely as the same would have been held and enjoyed by me if this assignment and sale had not been made.

In testimony whereof, I hereunto set my hand and affix my seal this 28th day of April, 1874.

JNO. H. IMMEN. [L. S.]

Sealed and delivered in the presence of—
CHAS. DE KAY TOWNSEND.

Received for record April 30, 1874, and recorded in Liber V 17, page 246, of Transfers of Patents.

In testimony whereof, I have caused the seal of the Patent Office to be hereunto affixed.

[L. S.]
J. M. THACHER,
Acting Commissioner.

Ex'd: M. A. L.

DEFENDANT'S EXHIBIT NO. 3, OF REASSIGNMENT TO IMMEN.

Know all men by these presents:

That I, William G. Annan, of the city of New York, in consideration of the sum of one dollar to me in hand paid by John H. Immen, of Newark, New Jersey, do hereby grant, bargain, sell, assign, transfer and set over to him, his heirs or assigns, all my
21 right, title and interest of, in and to certain letters patent for improvement in spark-arresters for locomotives, letters patent No. 113,528, dated April 11th, 1871; reissue No. 5184, dated December 10th, 1872, granted to Francis Kearney and Luke F. Tronson.

Witness my hand June 22d, 1875.

WM. G. ANNAN.

In presence of—
WM. C. CLIFFORD.

Received for record, May 16th, 1883, and recorded in Liber W 29, page 198, of Transfers of Patents.

In testimony whereof I have caused the seal of the Patent Office to be hereunto affixed.

E. M. MARBLE,
Commissioner.

[L. S.]

Ex'd: F. C. T.

22 Circuit Court of the United States, District of New Jersey.

Francis Kearney *et al.* *vs.* The Lehigh Valley Railroad Company. } In Equity.

The complainant having this 17th day of September, 1883, moved to strike from the record certain testimony taken at Newark on the 1st day of September, 1883, said motion is denied, the said complainant, however, to have the right to except to any part of the record and to cross-examine the witnesses.

JNO. T. NIXON, *J.*

[Endorsed:] U. S. circuit court, district of New Jersey. Francis Kearney *et al. vs.* Lehigh Valley R. Co. Order denying motion, &c. Andrew McCallum, sol'r for def't. Filed Sept. 17, 1883. S. D. Oliphant, clerk.

23 Examination of witness produced, sworn, and examined before S. D. Oliphant, Esq., commissioner, at his office, in the Government building, Trenton, New Jersey, September 26th, 1883.

Present: Mr. S. D. Oliphant, commissioner; Mr. Malcolmson, for complainant; Mr. McCallum, for defendant.

Counsel for the defendant reopens the record taken September 1st, 1883, for the purpose of affording counsel for complainant an opportunity to state objections to the same, if he has any to make, and also recalls the witness, John H. Immens, for the purpose of affording counsel for the complainant an opportunity to cross-examine.

Counsel for complainant states that he has filed his objections to an examination had by the defendant, before a notary public, on the first of September; that he again repeats his objection to the same, and states that he will insist at the hearing that no such examination or statements, made before the notary public, can be used as testimony in this case; that he is here now, under the notice from defendant's solicitor, that he would proceed to take testimony in support of the plea in abatement in this case, and he is ready to proceed with the taking of such testimony.

Counsel for defendant says that under the order of the court of the 17th of September, 1883, he has opened the record therein referred to, for the purpose of counsel for complainant stating any objections, or taking any exceptions thereto, and he has also recalled the witness, Immens, for the purpose of cross-examination. If counsel for complainant has no exceptions to note, or questions to put to the witness in cross-examination, the said record will be again closed.

Counsel for the complainant states that he knows of no record in this case to be reopened, unless the alleged examination and
24 proceedings before a notary public, as referred to, and as such proceedings were excepted to at the time they were taken,

and all that was done before such notary public was done in the absence of complainant's counsel, he does not acknowledge any record in this case up to the present time, or at least up to the opening of the examination today. That the witness, Immens, being now present, he is ready to cross-examine him on any subject counsel for defendant may call upon him to testify in relation to.

(Defendant's counsel offers in evidence a paper marked " Francis Kearney and Mary F. Tronson against The Lehigh Valley Railroad Company. Defendant's Exhibit No. 1, Kearney and Tronson's acknowledgement of joint ownership and title. John R. Harden, notary public, N. J.")

(Also, a paper marked " Francis Kearney and Mary F. Tronson against The Lehigh Valley Railroad Company. Defendant's Exhibit No. 2, of Immens' assignment to Amman. John R. Hardin, notary public, N. J.")

(Also, a paper marked " Francis Kearney and Mary F. Tronson against The Lehigh Valley Railroad Company. Defendant's Exhibit No. 3, reassignment to Immens. John R. Hardin, notary public, N. J.")

JOHN H. IMMENS, a witness produced on the part of the defence, being duly sworn according to law deposeth and saith:

Direct examination by Mr. McCALLUM:

Quest. Please state your name, age, residence and occupation.

Ans. Age, fifty-two; machinery business; residence, Newark, N. J.; name, John H. Immens.

Quest. Do you know the complainants in this case, or either of them?

Ans. I do, both of them.

Quest. Did you know the late Luke F. Tronson?

Ans. I did.

Quest. Are you familiar with his handwriting, and also with that of Francis Kearney?

25 Ans. I am.

Quest. Please examine Defendant's Exhibit No. 1, now shown you, and state if the signatures thereto are those of the said Francis Kearney and Luke F. Tronson.

Ans. I saw them execute this instrument; the body of it is in my handwriting.

Quest. Are you the John H. Immens mentioned in said instrument?

Ans. I am.

Quest. Was it signed in your presence on the date thereof?

Ans. It was signed in my presence on the date named in the instrument.

Quest. Do you know Mr. William G. Annam of New York?

Ans. I do.

Quest. Please examine Defendant's Exhibit No. 2, and state if the signature of John H. Immens is your own signature.

Ans. I acknowledge that to be my signature.

Quest. Do you know Mr. Annam's handwriting?

Ans. I do.

Quest. Please examine Defendant's Exhibit No. 3 and state if that is signed by William G. Annam.

Ans. That is Mr. Annam's signature, and the body is in his handwriting.

Quest. The whole instrument is written by him?

Ans. Yes, sir.

Quest. Except the witness' signature?

Ans. Yes, sir.

Cross-examined by Mr. MALCOLMSON:

Quest. What is Mr. William G. Annam's business?

Ans. His business is in connection with an eastern manufacturing concern; it is in the granite business; he was formerly of the firm of Nichols, Thurston & Annam.

Quest. What was their business?

Ans. Lawyers.

Quest. What was his business at the time of these Exhibits 2 and 3 being made out?

26 Ans. He was secretary, also, of the Eagle Slate Company, of which Mr. Nichols was president.

Quest. Was he not a lawyer at that time?

Ans. Yes, sir.

Quest. How did you come to know about this suit?

(The question is objected to by defendant's counsel on the ground that it is irrelevant and immaterial.)

Ans. Mr. Kearney informed me during the month of April.

Quest. How soon after that did you see anybody connected with or representing the defendant?

(Same objection.)

Ans. That was after I returned.

Quest. Returned from where?

Ans. From my trip through Pennsylvania.

Quest. What time—what month?

Ans. During the month of April.

Quest. This year?

Ans. This year.

Quest. Who was it you saw representing the defendant?

(Same objection.)

Ans. I called on Mr. Mitchell.

Quest. Who is Mr. Mitchell, and why did you call on him?

Ans. He is superintendent of the Wyoming and the Delaware and Lehigh Valley Railroad Company.

Quest. Whereabouts is he?

Ans. At Wilkes Barre.

Quest. State what took place between you and Mr. Mitchell in relation to this suit.

(Same objection.)

Ans. I called on Mr. Mitchell and introduced myself; he took me with him to the shops and showed to me the device that he was using, and also stated to me that there was a suit in progress and a hearing was then about to take place, or had taken place, at Trenton; I stated to him that I was a one-third owner of the patent; that is all.

Quest. Please state for what purpose you went to see Mr. Mitchell.

(Same objection.)

27 Ans. Mr. Kearney, some time last fall, asked me to take a trip up, and see what they were using up there, and he called my attention to some of the engines that were in Jersey City as having a device similar to this.

Quest. Have you made any writing or transfers in relation to this patent since that time?

(Same objection.)

Ans. I have.

Quest. State what interest or alleged interest, and who to?

Ans. I assigned my interest to the Lehigh Valley Railroad Company.

Quest. Had you any other writing with Kearney and Tronson, besides the writing, Exhibit No. 1?

(Same objection.)

Ans. I had a previous contract with them, but that had expired.

Quest. What was its date?

Ans. The 5th of April, 1872; that expired on the 5th of April, 1873.

Quest. Is that the paper which you have just had in your hand?

Ans. Yes, sir; the agreement or contract.

Quest. Is that the original copy, which you were just looking at, and which Mr. McCallum has now?

Ans. That is the original document.

(Counsel for complainant asked counsel for defendant to permit the commissioner to make a copy of said original document, so that it may be a part of this record, and the commissioner to certify that such copy is a true copy of the original now present and referred to by the witness.)

(Counsel for defendant has no objections to a copy being made, but objects to the admissibility of the document in evidence, as being under cross-examination, entirely irrelevant and immaterial to the present issue.)

Quest. Please read to the commissioner the said writing referred to by you in your last three answers.

(Same objection.)

Ans. Witness read as follows:

28 Articles of agreement had, made, concluded and agreed upon, this fifth day of April, in the year of our Lord eighteen hundred and seventy-two, between Francis Kearney and Luke F. Tronson, of the city of Newark, in the county of Essex and State of New Jersey, of the one part, and John H. Immens, of the city of Newark, in the county of Essex and State of New Jersey, of the other part: Witnesseth, that whereas, the said Francis Kearney and Luke F. Tronson are the inventors of a new and useful improvement in 'spark-arresters for locomotives,' which is secured to them by letters patent of the United States, dated April 11th, A. D. 1871, and which they are desirous of having brought into general use on the railroads of the United States, and the said John H. Immens is about to undertake the sale and introduction thereof into use as the agent of the said patentees.

Now, it is agreed by and between the parties to this agreement, that the said John H. Immens shall be, and he is hereby appointed the sole agent of the said Francis Kearney and Luke F. Tronson, in the United States, for the introduction and sale of the said improvement, for the term of one year from the date hereof, but this appointment is not to prevent the said patentees from personally making sales of the right to use the said improvement, if they at any time desire so to do.

And it is agreed by and between the parties to this agreement, that the price or royalty, to be paid for the use of the said improvement, shall be fifty dollars for each engine to which the same may be applied, but if any one party shall propose to purchase the right to use the same upon a large number of engines, such moderate reduction, as in the judgment of the said Immen may be advisable, may be made from the said price of fifty dollars.

And it is further agreed, that as compensation to the said Immens, for his services in this behalf, he shall be entitled to retain twenty-five per cent. of all sums received by him from the sales of the right to use the said improvement, and that seventy-five per cent. of the amount, so received by him, shall be paid over by the said Immens to the said Kearney and Tronson as royalty; 29 and it is further agreed, that the said twenty-five per cent. shall be the full compensation of the said Immens for any services performed in executing the purposes of this agreement, and that the said Kearney and Tronson shall not be liable to him for any sum or sums of money for services, charges, expenses or otherwise, under this agreement or otherwise.

And the said John H. Immens doth hereby covenant and agree that he will make return monthly to the said Kearney and Tronson, their legal representatives and assigns, of all sales of the said right to use the said improvement, and of all moneys received upon such sales, and, upon such statement and return, pay over to the said Kearney and Tronson seventy-five per cent. of the moneys, received upon the said sales, as their royalty or shares of the same, under this agreement.

And the said John H. Immen doth further covenant and agree with the said Kearney and Tronson that he will use diligence and his best efforts to introduce the said improvement into use.

And the said Francis Kearney and Luke F. Tronson do hereby covenant and agree with the said John H. Immen, that upon the said Immen proceeding in good faith and with due diligence, to introduce the said improvement into use and complying with the agreement aforesaid, by making return to them, the said Kearney and Tronson, of his sales of the said improvement, and paying over to them their said royalty or share of seventy-five per cent. of the said sales, that no other agent or agents shall be appointed by them or any other person or persons, (other than said patentees,) authorized by them, to sell the right to use the said improvement in the United States, during the term of one year from the date hereof.

And it is further agreed, between the parties to this agreement, that in case it shall appear that no efficient effort is being made by the said Immen to effect sales of the said improvement, or the right to use the same, then the said Kearney and Tronson may,
30 at any time, during the said term of one year, upon three
months' notice in writing, to the said Immens, for that purpose, determine this agreement and revoke the said appointment of the said Immens as their agent for the purpose aforesaid, and in that case this agreement shall be mutually cancelled by the parties thereto.

In witness whereof, the parties to this agreement have hereunto interchangeably set their hands and seals, the day and year first above written.

F. KEARNEY. [L. S.]
LUKE F. TRONSON. [L. S.]
JOHN H. IMMEN. [L. S.]

Signed, sealed and delivered in presence of—
A. G. SAYRE.

Quest. Was there at any time prior to the signing of Exhibit 1 by Kearney and Tronson, any paper in writing between them and yourself except this one of April 5th, that you have just read?

Ans. There was no other; only two documents, the original contract and the subsequent contract made on the 10th of April, 1873.

Quest. That is all.

Redirect examination:

Quest. The transfer from you to the Lehigh Valley Railroad Company mentioned in your cross-examination, was made, when?

Ans. On the 10th of May, I think—as near as my recollection recalls the matter.

Quest. That was after the commencement of the suit?
Ans. Yes, sir.

JOHN H. IMMENS.

It is agreed by counsel that the commissioner may sign the jurat, and the name of the witness after the stenographer has written out his notes.

S. D. OLIPHANT,
Com'r and Examiner.

Sworn and subscribed before me, this 26th day of Sept. 1883.

S. D. OLIPHANT,
Com'r and Examiner.

31 United States Circuit Court, District of New Jersey.

FRANCIS KEARNEY and MARY F. TRONSON, as Adm'r,
vs.
THE LEHIGH VALLEY RAILROAD COMPANY.
} In Equity.

The consent in writing of Cochrane & Malcomson, solicitors of the complainants in the above cause, that Elwood C. Harris be substituted as solicitor of said complainants having been filed—

It is, on this second day of November, A. D. 1885, on motion of Elwood C. Harris, ordered that said Elwood C. Harris be substituted as solicitor of the complainants in the place of Cochrane & Malcomson.

JNO. T. NIXON, *J.*

[Endorsed:] U. S. circuit court, district of New Jersey. Francis Kearney and Mary F. Tronson, adm'r, *vs.* The Lehigh Valley Railroad Company. Order substitution sol. compl'ts. Elwood C. Harris, sol. compl'ts. Filed Nov. 2, 1885. S. D. Oliphant, clerk.

32 U. S. Circuit Court, District of New Jersey.

FRANCIS KEARNEY *et al.*
vs.
THE LEHIGH VALLEY RAILROAD COMPANY.
} On Bill in Equity.

EXAMINER'S SESSION,
CLERK'S OFFICE, TRENTON, *Feb'y 9th,* 1886.

Present: S. D. Oliphant, examiner; Elwood C. Harris, sol. for compl't-; And'w M. Callum, sol. for defendant.

Complainant- offers in evidence an agreement between Francis Kearney and Luke F. Tronson with John H. Inman, marked Compl'ts' Exhibit "A."

Objected to by counsel for defendants as being inadmissable, irrelevant, and immaterial.

It was agreed between counsel that the testimony should be taken by a stenographer, question and answer, and the signatures of the witnesses thereto be waived.

33 Francis Kearney, one of the complainants, being duly sworn according to law, testified as follows:

Direct examination.

(By Mr. Harris:)

Q. You are one of the complainants in this suit?

A. Yes, sir.

Q. Where do you reside?

A. In Newark, N. J.

Q. Mr. Tronson, with whom you obtained this patent, is not living?

A. No, sir.

Q. And his wife, as executrix under his will, is a party with you in this suit?

A. Yes, sir.

Q. (Paper handed to witness.) Just look at this paper which has just be- offered in evidence and marked Exhibit "A" and state whose signatures are attached to it.

A. The signatures of Mr. Tronson and myself and John H. Inman.

Q. Under that agreement Mr. Immon made some efforts to introduce your patent, did he not?

Objected to.

A. Yes, sir.

Q. Was there ever any other agreement between you and Mr. Tronson, on the one part, and Mr. Immon, on the other part,
34 respecting this patent?

A. None but the agreement that had expired before that paper was made.

Q. There was another paper between you?

A. No; only the one with the agreement for one year. When that expired Mr. Immon presented this paper. I don't know whether I am allowed to speak of it or not.

Q. One moment. (Witness shown Defendant's Exhibit No. 1.) The question was whether any other paper than this agreement ever existed between you and Mr. Immon.

A. No other.

Q. Except that?

A. Except this, which was after that one had expired.

Q. By whom was this paper you now hold, Defendant's Exhibit No. 1, signed?

A. It is signed by me and Mr. Tronson.

Q. What date does that bear?

A. April 10th, 1873.

Q. In whose handwriting is that paper?

A. I take it to be Mr. Immon's handwriting.

Q. Where did you first see that paper?

A. On Broad street.

Q. In Newark?

A. In Newark, near the Morris and Essex crossing, on the Delaware, Lackawanna & Western road.

35 Q. Who had it?

A. Mr. Immon had it.

Q. Was it written in its present form when you first saw it?

A. I did not see the paper; it was read to me on Broad street.

Q. What do you mean when you say you did not see it—that you did not bring it, read it, or what?

A. I did not read the paper. Mr. Immon read the paper to me on Broad street.

Q. What conversation took place between Mr. Immon and you, or what did he say about the paper when he read it?

Counsel for the defendants objects to the question as inadmissable—calling for parole evidence to vary the legal effect of a written instrument.

A. Mr. Immon took from a satchel he had with him the paper and read it to me on Broad street. When he came to the latter part of it—oh, he said that—he read it to me and said that he expected to go and see the New Jersey Central railroad on that day, as they had told him they were about ready to settle with him for the use of this spark-arrester. He took this paper from his bag and read it to me, saying that he had brought it for me and Mr. Tronson to sign, that they might see that he had authority to settle with them—with the Central railroad. When he came to the part that
36 reads "having a one-third interest therewith" Mr. Immon
made the remark to me that this paper was merely to show them that he had the right to settle. He put the paper in his bag and asked me if Mr. Tronson would sign it. I said, Mr. Tronson is just here. Walking to the shop I called him. He turned around and went into the bank—underneath the bank there—the first floor—close to the Morris & Essex crossing—and signed this paper. I took it from what he said when he came to the one-third interest—I paid no attention, as his last agreement was that he was to have one-third of any moneys collected instead of 25 per cent. on account of a reissue on the patent, which he agreed to pay $20 for the office fees in Washington, and instead of 25 per cent. to have one-third of the money which he would collect for the sale of the spark-arrester or patent. No other paper was ever made out. This paper I never saw afterwards. I asked Mr. Immons on one or two occasions if he would not appoint a day and have an agreement drawn up for his agreement on the new start—after he gave the $20. He said it was all right; there was no need of it.

Counsel for the defendant makes the same objection to the answer as to the question.

Q. Under the former agreement Mr. Immons was appointed your agent?

A. Yes, sir.

Q. For one year, to try and sell this spark-arrester?

37 A. Yes, sir.

Q. And he to receive 25 per cent. of all the sales he might make?

A. Yes, sir.

Q. Is the statement you have just made the explanation why he was to receive one-third instead of one-fourth?

A. Yes, sir; to receive one-third.

Q. Instead of one-fourth?

A. Instead of one-fourth.

Q. By reason of what?

A. By reason of paying $20 to me which I handed over to Mr. Tronson for the reissue of the patent.

Q. Was that reissued during the time of the previous agreement?

A. Well, the agreement for the reissue was shortly after the first agreement.

Q. And before this paper was signed?

A. And before that paper was signed.

Q. Did Mr. Immon make any arrangement for the sale of this patent to the New Jersey Central railroad afterwards?

A. Not until after that paper was signed. I never saw Mr. Immon or said that he had anything to do after that paper was signed. I had told Mr. Immons on one or two occasions, after his time had expired and he was unsuccessful in settling with the New Jersey
Central, that if he would go on and see the parties, the Lehigh
38 Valley, which he had been up to Easton, if he should come
to any arrangement, that I would see he would get his one-third allowed to him for the sale.

Same objection to the question and answer.

Q. Was there ever an agreement with Mr. Immons that he should be the owner of one-third of the patent?

A. No, sir; there was no such agreement as that for one-third ownership of the patent.

Same objection.

Q. After the commencement of this suit did Mr. Immon ever come to you with reference to this patent?

A. I met him one day at Market street. He was apparently waiting until I got off the train, and I walked with him from Market street to Chestnut street. He had been talking about the suit and he asked me if it was not going on in Trenton. I told him I could not tell him, that I had not heard that—whether it was or not. He said, "Yes, we must go away from home and hear what is going on. They will have it up in the country somewhere." I said, "You know more than I do, although I expect there is such to go on, but whether it is going on or not at present is more than I know at present."

Q. Did he say anything to you at that time about his being the owner of one-third of the patent?

A. No, sir.

39 Q. Has he ever at any time said to you that he claimed to take one-third of the patent?

A. No, sir; never.

Same objection.

WITNESS: I found, when speaking to him about if he would go on, if he would come to any agreement—I told him that I would say that he would be allowed as percentage a one-third of what he might collect. He never said that he owned one-third of the patent or expected to own one-third, or anything about it.

Counsel for the defendant objects to the whole of the foregoing evidence on the ground of its inadmissibility, on the ground that the legal effect of the written instrument referred to as Defendant's Exhibit No. 1 cannot be varied by parole evidence, not showing mutual mistake, and he gives notice that he will move to strike out said evidence at the hearing *if* the cause.

40 Cross-examination (*de bene esse*).

(By Mr. McCALLUM:)

Q. You say that the application for the reissue was made before you signed and Mr. Tronson signed this paper, Defendant's Exhibit No. 1?

A. Yes, sir.

Q. And that he paid you $20 on account of obtaining the reissue?

A. Yes, sir. Could I explain (interrupted)——

Q. Not now. And that was the consideration why he should get a ⅓ interest in the proceeds of the patent instead of a ¼? That is correct?

A. Yes, sir.

Q. Mr. Imman read the whole of the instrument to you, did he?

A. Yes, sir.

Q. And you understood from him that he was to have a ⅓rd interest with yourself in the proceeds of the patent?

A. ⅓rd of what he would collect instead of ¼, as before; not a ⅓rd interest in the patent.

Q. In the proceeds of the patent?

A. Yes, sir.

Q. He was to receive a ⅓rd interest in the proceeds of the patent. Is that correct?

A. Yes, sir.

41 Q. In consideration of his services and the $20 paid by him. That is correct, is it?

A. Yes, sir; one-third of the proceeds, as remarked, instead of one-quarter, with the New Jersey Central railroad.

Q. You added the last part after consideration, after finishing the former answer. Do you mean now to say that he was to have a one-third interest in any other proceeds of the patent?

A. His time had expired.

Q. I am talking about one-third.

A. One-third on all that he would sell during the year. He made no sale at all. We gave him this paper to give him a chance, as he represented that he was going to settle with the New Jersey

Central railroad; that they had written they wanted to come down. That is why that paper was signed.

Q. But there was no paper giving him authority for a year, excepting the one offered in evidence as Complainants' Exhibit A, was there?

A. That is the only paper.

Q. And that had expired before this other paper was executed, *was* it not?

A. Yes, sir. He said that he had (interrupted)——

Q. Well, hold on. There is no restriction as to time in this paper, Defendant's Exhibit No. 1, is there?

A. No; no restriction as to time.

42 Q. And there is no reservation of your right to annul that power thereby conveyed, is there?

A. No reservation; no, sir.

Redirect examination:

Q. Is this recital at the end of this paper, "he having one-third equal interest with ourselves in the said patent," true or false?

Objected to for the reasons before stated.

A. It is false of any one-third in the said patent other than a one-third interest as to the proceeds, as I before explained.

Q. After Mr. Imman took this paper, Defendant's Exhibit No. 1, from his satchel and before you signed it, did he add anything to it, or was it in the state that it now is, when you signed it?

A. I do not remember him doing anything to it. He returned the paper into his satchel again after he had read it to me.

Q. And then where did you go?

A. He asked me if Mr. Tronson would sign it, and I said, "Here is Mr. Tronson; I will speak to him." I explained to Mr. Tronson
that Mr. Imman's time had expired—that is, his first agree-
43 ment—and he had a paper with him that he wanted me and
him to sign to give him a chance to settle with the New Jersey Central railroad, as he had notice from them to call on them that morning and had the paper prepared in his bag. Mr. Tronson said, if I remember exactly, "Most assuredly," and he walked to the bank and signed the paper. I could not say whether Mr. Tronson read the paper. He looked at it, but whether he looked at it long enough to read the paper I could not say. I don't think he did.

Same objection.

Counsel for the complainants desires to put in evidence a certified copy of the assignment made by John H. Immans to the Lehigh Valley Railroad Company, bearing date May 10, 1883, and recorded in the Patent Office May 16, 1883, in W 29, page 198, Transfers of Patents.

Counsel for the defendant objects to the same as being immaterial in the present issue.

Adjourned to the day to be agreed upon.

[Endorsed:] No. 9.
4—314

44 United States Circuit Court, District of New Jersey.

FRANCIS KEARNEY *et al.*
v.
THE LEHIGH VALLEY RAILROAD COMPANY.

MASTER'S SESSION AT TRENTON, N. J., *Feb'y* 24, 1886.

Present: S. D. Oliphant, Esq., examiner; Andrew McCallum, Esq., sol'r for defendant; Elwood C. Harris, Esq., sol'r for complainant-.

Examination of Witnesses Produced, Sworn, and Examined on the Part of the Defendant.

Counsel for defendant offers in evidence a letter dated February 13, 1886, signed by McCurdy and Warden, marked Defendant's Exhibit No. "4;" also a letter dated Feb'y 17, 1886, and signed by James F. O'Rourke, marked Defendant's Exhibit No. 5.

The said letters were offered to show that the witness, John H. Immen, is dead.

(Counsel for complainant- objects to the competency of these letters to show that fact. This objection will be withdrawn on being satisfied of the truth of this offer on the part of the defendant on his own inquiry.)

Counsel for defendant also offers in evidence a letter dated May 21, 1883—three pages—marked Defendant's Exhibit No. 6, from J. H. Immen to A. McCallum.

(Counsel for complainant- objects to this letter as incompetent.)

Counsel for defendant offers letter dated June 1, 1883, same to be marked Defendant's Exhibit No. 7.

(Same objection by counsel for complainant-.)

45 Also letter dated July 31, 1873, M. D. Leggett to J. H. Immen, marked Defendant's Exhibit No. 8.

Also a letter dated April 26, 1883, McCarter, Williamson, and McCarter to A. McCallum, marked Defendant's Exhibit No. 9.

Same objection by defendant to letters Nos. 8 and 9.

ANDREW MCCALLUM, sworn as a witness on the part of the defendant:

I am solicitor for the defendant in this case. I knew John H. Immen, who has heretofore testified as a witness in this case. Since the last session, Feb'y 9, 1886, I have learned that he died at Bellevue hospital, New York city, Dec. 6, 1885. The letter, Defendant's Exhibit No. 5, I received from the warden of the hospital, and the letter from McCurdy and Warden, Defendant's Exhibit No. 4, I received from his late employer. I was first introduced to Mr. Immen by a letter from McCarter, Williamson & McCarter, of Newark, New Jersey, attorneys for the Lehigh Valley Railroad Company, Defendant's Exhibit No. 9. I am familiar with Mr. Immen's handwriting.

The two letters, Defendant's Exhibits Nos. 6 and 7, are in his handwriting, and are addressed to me.

With respect to the interest in the Kearney and Tronson patent, for infringement of which this suit is brought, he informed me that he first had a contract in writing with Kearney and Tronson to continue for one year from the fifth day of April, 1872, by which he was appointed sole agent to sell the right to use the patented improvement.

(Counsel for complainant- objects to the testimony as being incompetent because hearsay, and to all testimony as to what Mr. Immen informed the witness.)

That during the continuance of that contract it was found that the patent was not broad enough, and it was found advisable to reissue it with broader claims, and that upon his agreeing to pay the cost of reissue, it was agreed by Kearney and Tronson that he, Immen, was to receive one-third interest in the patent. That on this understanding he paid $40. That the application for the re-
issue was made through Cochrane and Malcomson, of New
46 York city, and obtained December 10, 1872. That as soon
as the reissue was obtained, he set to work to introduce the invention and sell the rights under the patent on the new arrangement, but being so much away he had no time to reduce the new contract to writing, and having an opportunity to dispose of the right to the Central Railroad of New Jersey, and being in a great hurry and desiring to make sure of his one-third interest, he drew the power of attorney with Kearney and Tronson's acknowledgment of joint ownership, (Defendant's Exhibit No. 1.)

That he read and explained the purport of the same to both Mr. Kearney and Mr. Tronson before they signed the paper, and that the same was to cover his right to one-third interest in the patent, and all proceeds thereof as had been before agreed upon, when he paid Mr. Kearney the $40 and agreed to reissue the patent.

That he afterwards discovered that the description of the device in the reissued patent was erroneous and contained mistakes which he understood rendered it of no value. That he thereupon applied to the Commissioner of Patents to have the errors corrected, but was informed in reply that they could be corrected only by another reissue of the patent.

That he had no money to pay for the second reissue, became discouraged, and believing that the patent was of no account he gave up all efforts to sell rights under it.

That he did not know of any suit having been commenced against the Lehigh Valley Railroad Company until he learned it from one of the officers of that road; that when he did learn of it he informed Mr. Malcomson of his interest in the patent, but receiving no satisfaction from him in the matter, he communicated the fact of his having one-third interest in the patent to the attorneys for the Lehigh Valley Railroad Company, McCarter, Williamson, and McCarter, and finally disposed of his interest to the defendant. Defendant's Exhibit No. 8 is the letter he received from the Commissioner of

Patents, and it was given to me by Mr. Immen along with 47 the original contract of April 5, 1872, and other papers relating to the transaction.

Cross-examination by Mr. HARRIS:

Question. Your testimony as just given you have read from a paper previously prepared by you?
Answer. Yes.

Adjourned.

48 United States Circuit Court, District of New Jersey.

FRANCIS KEARNEY and MARY F. TRONSON, Executrix, &c.,
vs.
THE LEHIGH VALLEY RAILROAD COMPANY.

By NIXON, *J.*:

The bill of complaint was filed in this case — and Mary F. Tronson, as executrix of Luke F. Tronson, deceased, against the defendant corporation for an injunction and for the recovery of profits and damages for the alleged infringement of reissued letters patent No. 5184 for new and useful "improvements in spark-arresters for locomotives."

The defendant has put in a plea in abatement of the suit for the non-joinder of parties, alleging that at the time of the commencement of the action and prior thereto the complainants were not the sole and exclusive owners of said letters patent, and that one John H. Immer, of Newark, New Jersey, had an equal undivided one-third interest therein.

In support of the plea the defendants offered in evidence the following written certificate executed on the day of its date, duly received for record July 2, 1873, and recorded in Liber V 16, p. 289, of Transfers of Patents:

"To whom it may concern:

49 This certifies that John H. Immer is fully authorized and empowered to make any contract with the Central Railroad of New Jersey that may be binding on our part for the sale of the patent right on spark-arrester, as secured to us by letters patent 113,528, dated April 11th, 1871, and reissue 5184, dated December 10, 1872, he having one-third equal interest with ourselves in the said patent.

(Signed) F. KEARNEY.
LUKE F. TRONSON.

Newark, April 10, 1873."

The counsel for the defendant insists that the paper constitutes an equitable assignment of the one-third ownership in the reissue; that it is a writing free from all ambiguity, and that the complainants are estopped from showing by paral such was not the agreement and intention of the parties.

But it does not seem to be a case for the invocation of the doctrine of estoppel. The facts are substantially as follows:

Kearney and Tronson obtained the original letters patent on April 11, 1871, for a new improvement in spark-arresters, and, being desirous of bringing the invention into general use on the railroads of the United States, they entered into an agreement with one John H. Immer on April 5, 1872, in which they constituted him their sole agent to sell patent rights for the period of one year at the rate of fifty dollars for the use of said improvement upon each engine to which it should be applied; and they further agreed that Immer should be authorized to retain twenty-five per cent. of all
50 monies received by him in said sales for his full and complete compensation, and should pay to the patentees the remaining seventy-five per cent.

During the continuance of this contract the parties came to the conclusion that the claims of the patent were not broad enough to fully cover the invention, and a surrender and reissue was deemed necessary. The patentees not having the means to pay the required fees, it was agreed that Immer should have his rate of compensation changed from twenty-five per cent. to thirty-three and one-third per cent. of the proceeds of the sales of patent rights on the condition that he should pay the costs of the reissue. The reissue was obtained on December 10, 1872, and he made the necessary payment of fees, but no change was formally introduced into the written agreement. It expired April 5, 1873. A few days afterwards Immer called upon Kearney with the above paper or certificate, stating that he wanted authority to settle the claim for infringement which they had against the New Jersey Central road, and that he had drawn the paper to show to the officers of the road that he was authorized to make the settlement, and at the same time to express the new arrangement as to his compensation which had been agreed to. With this explanation of its meaning, Kearney and Tronson signed the certificate, and there is no evidence that Immer ever gave any other construction to it or made any claim to ownership in the patent until after this suit was brought, unless the assignment of the one-third of said patent by Immer to one Annan on April 28, 1874, and the reassignment of the same by Annan to Immer on June 23, 1875, be construed to indi-
51 cate such claim.

The bill of complaint in this cause was filed March 15, 1883, by Kearney and the executrix of Luke F. Tronson, claiming to be the sole and exclusive owners of the patent. It was after this date that any notice came to the defendant that Immer set up any claim to ownership in the patent. On May 10, 1883, he assigned to the defendant corporation all his right in the reissue and added a special release and discharge for all claims for damages for any prior infringement.

The defendant therefore was a purchaser with notice that complainants denied the claim of Immer to ownership in the letters patent, and it is subject to all the defences that could be set up against Immer himself.

The certificate was not an assignment of the patent or any part thereof, and, judging from its form, it was not intended by the parties to be so regarded. Whether its use should be limited to the settlement of the claim against the New Jersey railroad it is not necessary to determine, although that seems to be its fair import.

It is clearly competent, however, for the complainants to set up the same defence against the claim of ownership by the defendant corporation as they could have set up against Immer, and the testimony satisfies me that when the patentees signed the certificate they understood the scope and meaning of the paper to be that Immer should be entitled to receive the one-third instead of the one-fourth as before of the moneys realized on the sale of patent rights.

52 This construction of the certificate does not invest Immer or his assignee with any title, legal or equitable, in the patent itself. It simply determines the rate of compensation to which he was entitled on sales of patent rights. I am aware that the phraseology used is capable of a different construction, but I regard any other construction as aiding Immer in his attempt by deception to get more than the patentees intended he should have.

There must be a decree in favor of the complainants on the plea.

(Opinion.) (Filed June 3, 1886.)

53 United States Circuit Court, District of New Jersey.

Francis Kearney & Mary F. Tronson,
Executrix, &c.,
vs.
The Lehigh Valley Railroad Company.
} On Bill, Plea, and Replication.

This cause coming on to be heard at the regular term of this court in the presence of Elwood C. Harris, of counsel with the complainants, and of A. McCallum, of counsel with the defendant, and the court having considered the evidence taken upon the said plea and heard the arguments of the counsel of the respective parties—

It is thereupon, on this eighteenth day of June, in the year of our Lord one thousand eight hundred and eighty-six, on motion of Elwood C. Harris, of counsel with the complainants, ordered that the said plea be overruled, with costs, and that the defendant answer the complainants' bill within thirty days after service of the certified copy of this decree, and that if the defendant fail so to do the complainants' bill be taken as confessed against it.

JNO. T. NIXON, *J.*

[Endorsed:] No. 12. U. S. circuit court, district of New Jersey. Francis Kearney & Mary F. Tronson *vs.* The Lehigh Valley Railroad Company. Order overruling plea. Elwood C. Harris, sol. of compl'ts. Filed Jun- 18, 1886. S. D. Oliphant, clerk.

54 United States Circuit Court, District of New Jersey.

FRANCIS KEARNEY and MARY F. TRONSON
vs.
THE LEHIGH VALLEY RAILROAD COMPANY.
} In Equity.

Answer.

(Filed July 10th, 1886.)

The answer of The Lehigh Valley Railroad Company, defendant, to the bill of complaint of Francis Kearney and Mary F. Tronson, complainants.

The defendant, now and at all times hereafter saving and reserving to itself all benefit and advantage of exception which can or may be had or taken to the many errors, uncertainties and other imperfections in the said complainants' bill of complaint, for answer thereunto or unto so much and such parts thereof as the defendant is advised is or are *im*material or *un*necessary for it to make answer unto, the defendant for answer says:

I. That it does not know, save as alleged in said bill of complaint, whether the complainants are citizens of the State of 55
New Jersey or whether the said Mary F. Tronson is the executrix of the last will of Luke F. Tronson, and, therefore, denies the same and leaves the complainants to make such proof thereof as they shall be advised is material.

II. Admits that it is a railroad company or corporation doing business in the State of New Jersey and elsewhere.

III. That it has been informed and admits to be true that Francis Kearney and Luke F. Tronson made application to the Commissioner of Patents of the United States for the grant of letters patent for the alleged invention of an improvement in spark-arresters for locomotives, but denies that the said Francis Kearney and Luke F. Tronson were the original and first inventors of the alleged improvement described in said letters patent, and the specification forming a part thereof; and further says that it does not know, and is not informed, save by said bill of complaint, whether or not the said Francis Kearney and Luke F. Tronson did properly make application for said patent, and did comply with all the requirements of law, and therefore denies the same, and leaves the complainants to make full and ample proof thereof in each and every particular.

IV. That defendant does not know, and is not informed, save by said bill of complaint, whether or not letters patent of the United States bearing date April 11th, 1871, and numbered 113,528, were granted and delivered to said Francis Kearney and Luke F. Tronson, in due form of law, and therefore denies the same, and leaves complainants to make such proof thereof as they shall be advised is material; and further denies that said letters patent granted or secured, or could grant or secure to said Francis Kearney and Luke

F. Tronson, their heirs or assigns, any exclusive right or rights whatever.

V. That it is informed and admits to be true that said letters pat-
ent No. 113,528 were surrendered and reissued on the 10th
56 day of December, 1872, and numbered 5184, but denies that
said letters patent were surrendered and reissued for lawful
cause; and the defendant avers that said original letters patent were not inoperative or void by reason of a defective specification, or for any reason set forth in the statute in such cases made and provided; that the said reissue is not for the same invention described and claimed in the said original patent; that new matter has been introduced into the specification of said reissued patent contrary to the statute in such case made and provided; that by the said reissue the scope of said original patent has been enlarged and extended so as to cover a different invention from that described and claimed in the said original patent; and that said reissue was not applied for within a reasonable time after the date of said original patent, and that therefore the said reissued patent, No. 5184, is invalid, null and void.

VI. That defendant does not know, and is not informed, save by said bill of complaint, whether or not on the 9th day of November, 1877, the said Luke F. Tronson departed this life, leaving a widow, the said Mary F. Tronson, and three children, and leaving a will, or whether said will was admitted to probate, or whether a certificate of administration was granted as alleged in said bill, and therefore denies the same and leaves complainants to make full and ample proof thereof in each and every particular.

VII. That the defendant does not know, and is not informed, save by said bill of complaint, that the said Francis Kearney and the said Luke F. Tronson, before his death, were at great expense and trouble in and about said invention, and therefore denies the same.

And further answering, denies that the said alleged improvement in spark-arresters for locomotives is of great benefit and advantage, and avers that the same, as described in the specification of said patent, is inoperative, of no practical utility, and of no value whatever.

VIII. Defendant, further answering, denies that the said Francis
Kearney and Luke F. Tronson were the true, original, first
57 and joint inventors of the alleged invention described and
claimed in said reissued patent No 5184, or of any substantial
or material part thereof.

IX. Further answering, defendant avers that the said alleged invention, or all substantial and material parts thereof, set forth and claimed as new in said reissued patent, were long before the alleged invention or discovery by Francis Kearney and Luke F. Tronson, shown and described in letters patent of the United States, granted as follows:

To Leonard Phleger, June 26, 1841, No. 2143,
To Ethelred May, July 28, 1857, No. 17884;
To James L. Vanclain, August 20, 1861, No. 33114;

To Allen S. Sweet, Jr., June 23, 1863, No. 38992;
To James Smith, August 16, 1870, No. 106,515;
To Weidman, Major & Sample, December 20, 1870, No. 110,315;
To James Smith, March 7, 1871, No. 112,506.

X. Further answering, defendant denies that it has ever made and used, or cause to be made and used, spark-arresters for locomotives of the construction shown and described in said reissued letters patent No. 5184; and denies that it has in any manner infringed upon any legal right secured to complainants by virtue of said letters patent; and it avers that the locomotive spark-arresters it used at the time said bill of complaint was filed were of an entirely different construction, and were invented and used by an employé of the defendant before the time said Kearney and Tronson made application for the letters patent set forth in said bill of complaint, to wit, by Alexander Mitchell, who now resides at Wilkes Barre, in the State of Pennsylvania.

That the defendant has used a number of differently constructed spark-arresters, which have been invented and patented by the said Alexander Mitchell.

And the defendant prays the same benefits of the facts and things herein set forth as if for the reason thereof it had demurred to said bill of complaint, where a demurrer would have been proper, and the same benefits thereof as if it had specially pleaded to said bill.

58 And the defendant, on information and belief, denies every allegation in said bill of complaint not hereinbefore admitted, answered or denied.

Wherefore the defendant prays to be hence dismissed, with all reasonable costs and charges in this behalf most wrongfully sustained.

ANDREW McCALLUM,
Solicitor for Defendant.

STATE OF PENNSYLVANIA, } *ss:*
County of Northampton, }

Before me personally came H. Stanley Goodwin, general superintendent of the Lehigh Valley Railroad Company, defendant in the foregoing answer named, and, being duly sworn according to law, says that the statements contained in the foregoing answer, so far as the same are stated on the knowledge of this defendant, are true, and so far as the same are stated on information and belief, this affiant believes them to be true.

H. STANLEY GOODWIN.

Witness my hand and seal this third day of July, 1886.

[L. S.] J. DAVIS BRODHEAD,
Notary Public.

59 Filed July 31, 1886.

United States Circuit Court, District of New Jersey.

FRANCIS KEARNEY & MARY F. TRONSON, Executrix, &c., *vs.* THE LEHIGH VALLEY RAILROAD COMPANY.	In Equity. Replication.

The replication of Francis Kearney and of Mary F. Tronson, executrix of the last will of Luke F. Tronson, deceased, complainants, to the answer of The Lehigh Valley Railroad Company, defendant.

These repliants, saving and reserving to themselves all and all manner of advantage of exception to the manifold insufficiencies of the answer of the said defendant, for replication thereunto says that they do and will aver and prove their said bill to be true, certain, and sufficient in the law to be answered unto by the said defendant, and that the answer of the said defendant is uncertain, untrue, and insufficient to be replied unto by these repliants; without this, that any other matter or thing whatsoever in the said answer contained material or effectual in the law to be replied unto, confessed and avoided, traversed or denied, is true.

All which matters and things these repliants are and will be ready to aver and prove as this honorable court shall direct, and humbly pray as in and by their said bill they have already prayed.

ELWOOD C. HARRIS,
Solicitor & of Counsel with Compl'ts.

[Endorsed:] 13½. United States circuit court, district of New Jersey. Francis Kearney *et al. vs.* The Lehigh Valley Railroad Company. Replication. Elwood C. Harris, sol. of compl'ts.

60 United States Circuit Court, District of New Jersey.

FRANCIS KEARNEY and MARY F. TRONSON *vs.* THE LEHIGH VALLEY RAILROAD COMPANY.	In Equity.

It is agreed by the parties hereto that testimony may be taken under the 67th rule, as amended, before any U. S. commissioner or notary public on giving 10 days' notice of the time and place, either at the shops of the defendant or in New Jersey or New York city.

E. C. HARRIS, *Sol. Compl't-.*
A. McCALLUM, *Sol. for Def't.*

Testimony taken before me, A. B. C. Salmon, a notary public, at my office, No. 802 Broad street, Newark, N. J., this sixth day of October, A. D. 1886, at 10 o'clock a. m., in the presence of Elwood C. Harris, of counsel with the complainants, and of Andrew McCallum, of counsel with the defendant, on behalf of the complainants.

Complainant's counsel offers in evidence certified copy of Kearney & Tronson's patent, reissue No. 5184, Dec. 10th, 1872, entitled "Improvement in spark-arresters for locomotive," and the same is marked Complainant's Exhibit No. 1.

61 Complainants' counsel offers in evidence certificate of the surrogate of the county of Essex of proof of the last will of Luke F. Tronson, deceased, and that Mary F. Tronson, one of the complainants, is the executris thereof, and the same is marked Complainants' Exhibit No. 2.

ROBERT H. QUINN sworn on behalf of the complainants.

Direct examination by Mr. HARRIS:

Q. Where do you live?

A. 1000 Newark avenue, Jersey City.

Q. What is your present employment and for how long have you been employed?

A. I am an engine-trier. I was machinest in the Pennsylvania Railroad Company this 14 years and employed on the Meadows between here and Marion.

Q. How were you employed in the years 1881 and 1882?

A. I am not positive, but I believe I was in the round-house at night, doing the machinest work under Mr. Kearney.

Q. (Witness, being shown affidavits and exhibit filed in this cause March 24, 1883, on motion for injunction, is asked:) Are you the Robert H. Quinn that made oath to the first affidavit?

A. That is my signature.

62 Q. There is annexed to said affidavit two drawings, marked Exhibit 356 and Exgibit 363. Will you state whether you ever saw those drawings before; and, if so, where they came from?

A. Those are my drawings. I made them.

Q. Do you know how long before that affidavit was made?

A. No; it was within a couple of weeks, anyhow. I didn't think this would occur, and I paid no attention and made no memorandum.

Q. Where did you make those drawings?

A. In the round-house of the Penn. Railroad Company, on the Meadows.

Q. Will you state what the one marked Exhibit 356 represents?

A. It represents the spark-refractor.

Q. Out of what?

A. Out of a locomotive.

Q. Did you see such a spark-refractor as that in a locomotive; and, if so, what locomotive?

A. I know that it was a Lehigh Valley engine, and I believe it was 356.

Q. That is the number of the engine, you mean?

A. Yes, sir.

Q. Did you also make the drawing marked Exhibit 363?

A. Yes.

63 Q. From what did you draw that?

A. From the engine 363, I believe; I can't swear to that.

Q. Of what railroad?

A. Lehigh Valley.

Q. Where was this engine when you saw this part of it?

A. In the Meadow shops—round-house.

Q. Were both these engines used by the Lehigh Valley Railroad Company?

A. Yes.

Q. Do these two drawings represent the same device?

A. Yes; the same.

Q. They were alike?

A. Yes, sir.

Q. What part of a locomotive engine is shown by Exhibit 363?

A. The front end or smoke-arch.

Complainants' counsel offers in evidence the two drawings above referred to by the witness and annexed to the affidavits, and the one called Exhibit 356 is now marked Complainants' Exhibit No. 3, and the one referred to as Exhibit 356 is now marked Complainants' Exhibit No. 4.

64 Q. Of what was the spark-refractor, as shown in these drawings, constructed?

A. It is my belief it was cast iron. It is so long since I didn't pay any attention to it.

Q. Did you make the figures on No. 3—$\frac{3}{16}$, occurring twice, and $3\frac{1}{4}$, occurring once—at the time you made the drawing?

A. Yes, sir.

Q. What does the $\frac{3}{16}$ mean?

A. The width of the bar; also the width of the opening.

Q. And the $3\frac{1}{4}$, what does that mean?

A. That is the length of the opening.

Q. How did the openings run—up and down?

A. Straight up and down.

Q. What was the height of this grate?

A. 18 inches.

Q. And the diameter at the top and bottom respectively?

A. 18 inches and 12 at the bottom.

Q. Does Exhibit 4 show how this grating was attached to the petticoat pipe and about its location in the steam head?

Objected to as leading and because the drawing is the best evidence.

A. Yes, sir.

Q. Where do the exhaust pipes enter this grating?

A. At the bottom.

65 Q. And do you know how far up the exhaust pipes extended?

A. No; it is not marked here.

Q. Do you remember whether you saw this same grate on any other than the two engines you have mentioned?

A. I have seen it—I couldn't just say it is the same, but I have seen grating of that drawing in several of the other engines.

Q. Of what railroad?

A. The Lehigh Valley.

Q. Did this grating form a circle around the petticoat pipe, or how was it?

A. It is cone-shape—round.

Q. Did the slots continue all the way around it?

A. Yes; but there is a joint where it is attached together in pieces.

Q. You may refer to the affidavit as to the time when it was sworn to, the 8th of February, 1883, and state whether these drawings were made before or since that date.

A. Before that date.

Cross-examination by Mr. McCallum:

Q. Do you understand mechanical drawings sufficiently to say what is represented by them?

A. I believe I do.

66 Q. Please look at the drawing on blue print now shown you and state if that is a correct representation of the spark retarder or arrester you saw in use on engines 356 and 363 of the Lehigh Valley railroad.

A. According to *my* drawing, this has got five slots, and according to mine, has only got three.

Q. (Question read.)

A. This is the very same that I saw in the locomotive.

Counsel for defendant asks the notary to mark this blue-print drawing for identification as Defendant's Exhibit "A."

Q. Please look at the photograph now shown you and state if that is a correct representation of the spark-arrester you saw on said engines.

A. I believe that is something like it. I don't know whether that is what I have drawn from, but it is the same idea—the same construction.

The photograph referred to is marked for identification Defendant's Exhibit "B."

Q. Please look at the photograph now shown you and state if you ever saw a spark-arrester of that construction in use on the Lehigh Valley railroad.

A. No; I can't say I did.

67 Last-mentioned photograph offered and marked for identification Defendant's Exhibit "C."

Q. Have you made any examination since the time you made the affidavit, February 8th, 1883?

A. No.

Q. Please look at the photograph now shown you and state if you ever saw a spark-arrester of that construction in use on the Lehigh Valley railroad.

A. No, sir.

Photograph referred to marked for identification and marked Defendant's Exhibit "D."

Q. Please look at drawing now shown you and state if you ever saw a spark-arrester of that construction in use on the Lehigh Valley railroad.

A. No; I don't remember.

Drawing shown witness is the drawing accompanying the Kearney & Tronson patent, Complainants' Exhibit 1, having reference to the last question and answer.

Q. You made some reference in your direct testimony to a petticoat pipe. Is not a petticoat pipe one which resembles the garment of that name—open at the top and bottom?

A. Yes, sir.

68 Q. What part of the spark-arrester do you refer to as having seen on the engine- 363 and 356 as a petticoat pipe?

A. The same as what is on drawing here, 356, Complainants' Exhibit No. 3.

Redirect examination:

Q. Will you point out in Exhibit 4 the petticoat pipe?

A. From the top of the grating on up to the top of the box.

Q. Is the petticoat pipe shown on Exhibit No. 3?

A. No.

Recross-examination:

Q. What do you mean by saying in one answer that the drawing 356, Complainants' Exhibit No. 3, is the petticoat pipe and another answer saying that the petticoat pipe is not shown on said drawing? Please explain.

A. Referring to this (No. 3), I did not understand you in regard to the petticoat pipe. Now, we generally call this from the top of the grate extending up to the smoke-arch the petticoat pipe. I would call it all as workmen call it—all a petticoat pipe, as it is generally called. Those grates are not used in our department.

Q. Referring to drawing, Complainants' Exhibit 4, is not the pipe extending from the top of the grating a straight pipe,

69 of the same diameter throughout?

A. It shows that in the drawing.

Q. It is therefore not shaped like a petticoat?

A. No.

Q. Is not the upper end secured or connected with the smokestack so as to be practically a part of the stack?

A. I don't know. I didn't pay any attention to it.

Q. Is not the lower end of it closely attached to the top of the screen?

A. Yes.

Q. It is not, then, an open-ended pipe like the petticoat pipe shown in the drawing of the Kearney & Tronson patent, is it?

A. No; this drawing here (referring to Complainants' Exhibit No. 4) is attached close to the exhaust pipe, but I didn't look at the engine itself at the top.

Q. Is the spark-arrester pipe or the petticoat pipe of the patent the same as Exhibit 4 or the blue drawing?

A. No.

ROB'T H. QUINN.

Sworn and examined before me this 6th day of October, 1886.

—— ——,
Notary Public.

70 JAMES BREISCH sworn on behalf of complainants.

Direct examination by Mr. HARRIS:

Q. Where do you reside and what is your present employment?

A. I reside at Flemington, N. J., and am a locomotive engineer.

Q. In whose employ at the present time?

A. Lehigh Valley Railroad Co.

Q. Were you ever employed by the company in Jersey City?

A. Yes, sir.

Q. What did you do there?

A. I had charge of the engines and sometimes went on an extra run if a man got sick or something like that.

Q. In such employ were you accustomed to look in the smokebox of locomotives?

A. No; very seldom.

Q. You have done so, however?

A. Yes; occasionally; but very seldom I had any business in the front end of the engine.

Q. Will you look at the blue-print drawing marked "A" for identification by the defendant and state whether you ever saw a grating like the grating marked B?

A. Something like it; yes.

Q. In how many engines have you ever seen it—in more than one?

71 A. I remember seeing something like—nearly. I don't remember whether exactly or not.

Q. Do you think in more than one?

A. I couldn't tell, but I have seen that kind of a grating in a Lehigh Valley engine while I was down there.

Q. About how long ago?

A. That I couldn't tell. I have been down there about nine years, in Jersey City; but how long they had them in I don't know.

Q. Of what was this grating made?

A. Cast iron, that I seen.

Q. Cast in sections or as one piece?

A. Cast in sections.

Q. How did the slots run in this grating?

A. The one I seen had the slots in the same as that is, up and down.

Q. Do you remember about how large the openings were, in length and width?

A. I couldn't tell. I should judge some of the slots were about three inches long and some of them about half as long, and looked to me about $\frac{3}{16}$ in width.

Q. Was such a grating used for a considerable length of time?

A. That I can't tell.

Q. You said they were not used now. Have you an idea how long since they were taken out?

72 A. No, sir.

Q. Where was this grating with reference to the petticoat pipe?

A. We had what we call a lifting pipe. We do not use a petticoat pipe when we use a lifting pipe.

Q. The lifting pipe you speak of extends from the top of that grate up to the smoke-stack?

A. No; I mean by the lifting pipe a sheet-iron pipe extending around the grating in front, the front part of it.

Q. What do you call the pipe extending from the top of the grating up into the smoke-stack?

A. Well, I most forget whether ours runs up to the arch.

Q. Did you ever hear that called a petticoat pipe?

A. I did not; not that I remember; they may call it petticoat pipe, for all I know.

Cross-examination by Mr. McCallum:

Q. Look at the drawing now shown you, Complainants' Exhibit 1, and state if that is what you understand to be a petticoat pipe?

A. Yes, sir.

Q. Is it so called because it is wider at the bottom than at the top and open at both ends?

73 A. I suppose so.

Q. Is not a petticoat pipe also one through which the smoke and gasses can pass in at both ends?

A. Yes, sir.

Q. Do you find any such petticoat pipe shown in the blue-print drawing Defendant's Exhibit "A" for identification?

A. No, sir.

Q. Answer the same question with reference to Complainants' Exhibits Nos. 3 and 4. Do you find a petticoat pipe there?
A. I do not.

Redirect examination:

Q. In using a locomotive with grating and pipe, as shown in complainants' patent, would anything pass into the pipe marked E except at the bottom?

Question objected to, as it is not shown that the witness ever used a device such as is shown by the patent referred to in the question.

A. No; certainly not; not in a lifting pipe.
Q. Then you speak of the pipe E as a lifting pipe?
A. Yes, sir.

JAMES BREISCH.

Sworn and examined before me this sixth day of Oct., 1886.

—— ——.

74 LYMAN M. WAER sworn on behalf of complainant-.

Direct examination by Mr. HARRIS:

Q. Where do you reside and what is your present employment?
A. Locomotive engineer; live, 16 Jefferson street, Newark, N. J.
Q. And by what company are you employed at present?
A. Lehigh Valley, and have been employed by them in the neighborhood of nine years.
Q. (Showing witness blue print, Defendant's Exhibit "A.") Will you state whether you have seen such a grate used in locomotives of the Lehigh Valley Railroad Company as that marked " B."
A. I think I have.
Q. About how long ago?
A. Well, it is two years past.
Q. Upon how many locomotives have you ever seen such a grate?
A. Only one.
Q. Have you ever examined many of their locomotives or any except the one you speak of?
A. No, sir.
Q. Of what was the grating constructed, and as a whole or in sections.
75 A. It was constructed of cast iron and in sections.
Q. State about the height and about the diameter, top and bottom, of this grating.
A. I never measured it. Well, I can make a rough guess at it; 15 to 18 inches, maybe, high. I can hardly judge as to the diameter.
Q. What was the shape of the opening in this grate, and how did they run?

A. Up and down. The opening was 2½ to 3 inches long and about one-eighth or three-sixteenths wide, as near as I can judge.

Q. Were you running this engine in which it was?

A. Yes, sir.

Q. Do you know for about how many years you ran an engine with such a grating?

A. I couldn't tell.

Q. A month or two or several years?

A. It might have been a couple of months or it might not.

Q. Did you know of its being put in and taken out?

A. No, sir.

Cross-examination by Mr. McCallum:

Q. Have you ever examined any other engines belonging to the Lehigh Valley Railroad Company than the one you refer to in order to ascertain what kind of a spark-arrester was used?

76 A. I don't recollect I ever did.

Q. Do you not know how long the one you saw was used?

A. No, sir.

—— ——.

Sworn — and subscribed before me this sixth day of Oct., 1886.

LYMAN M. WAER,
Notary Public.

77 Francis Kearney, one of the complainants, sworn on his own behalf.

Direct examination by Mr. Harris:

Q. You are one of the complainants?

A. Yes, sir.

Q. Where do you reside?

A. 124½ Pacific street, Newark, N. J.

Q. You are one of the patentees of letters patent for spark-arresters, No. 113,528, dated April 11, 1871, and reissue No. 5184, dated December 10th, 1872?

A. Yes, sir.

Q. Is Mr. Tronson still living?

A. No, sir.

Q. About when did he die?

A. He has been dead for some time, to my knowledge; at least two years; probably more than that.

Q. He died before the commencement of this suit?

A. Yes, sir.

Q. You and he were the inventors of this patent?

A. Yes, sir.

Q. Where were you and Mr. Tronson employed, and at what, at the time you made the application for this patent?

78 A. Mr. Tronson was master mechanic on what was known as the Morris & Essex railroad at that time, and I was roundhouse foreman at Spring street, Newark, N. J.

Q. With reference to the time when you made application for the patent, when had you perfected the invention patented—how long before the application?

A. I think we experimented a couple of years or more before the application was made.

Q. Just look at this grating and state what it is. (Witness shown piece of grating.)

A. This is one section forming the circle of our spark-arrester. Eight of those makes the circle. This is larger at the bottom than at the top. This sets on a base plate like that (indicating). Those projections allows it to have air at the bottom. The petticoat pipe fastens around the top and extends to the top of the smoke-arch, clean to the smoke-stack. Those openings lengthwise prevent the escape of anything larger than will pass through openings. The object in having the bar so long is to give a better natural draft for the escape of the smoke and gasses and cinders.

Q. Is that grating cast in the same form as shown in your original patent and in the reissue?

Objected to.

79 Question objected to, it not being shown by either the original or reissue patent that the grate is made by casting in the manner referred to in the question *reissue*, but, on the contrary, is referred to in the reissue as made with straight, vertical bars of iron placed at small distances apart.

A. I think it is.

Q. Was a grating of this form tried in any locomotives by you and Mr. Tronson before your application for a patent?

A. That I am not able to answer, as to the date.

Counsel for complainants offers in evidence grating last shown witness, which is marked Exhibit 5 for complainants.

Q. Did you ever, in company with Mr. Quinn, examine any locomotives of the Lehigh Valley Railroad Company?

A. Yes, sir.

Q. State how many different ones.

A. We examined three.

Q. Did Mr. Quinn make the drawings that he has referred to at the time of this examination?

A. Yes, sir.

Q. Referring to Complainants' Exhibit 4, is there any pipe shown on that exhibit that you would call a petticoat pipe?

80 A. No; not that I would call a petticoat pipe. There is a pipe or a part of a pipe covering this grating. The grating could not be seen from the front without removing a slide door in this lower pipe surrounding the grating.

Q. To what is the upper end of the grating attached in this exhibit?

A. It is fast to the grating pipe—secured to the grating—and that pipe extends up to the top of the smoke-arch.

Q. Into what does that pipe open at the top?

A. Into the smoke-stack.

Q. Is that grating attached to the grating pipe, as you call it, in the same form as the grating in your patent is attached to the petticoat pipe?

A. It amounts to the same, but ours comes over the outside of the grating.

Q. In what direction are the slots in this grating?

A. Upright; up and down.

Q. In size how do they compare with the slots shown in your grating?

A. They compare very near. I think ours is a little wider opening; our opening is longer.

Q. About how long before the commencement of this suit did you first learn that the Lehigh Valley Railroad Company
81 were using such a grating as has been described?

A. I can't give any positive date. I should say a year; probably more than that; but they had been notified of infringement. We got no answer from them.

Q. Do you know whether or not they continued to use this grate after the commencement of the suit?

A. That I couldn't say.

Q. You spoke a little while ago of experimenting with other devices before making your application for this patent. Did you use or apply other devices to locomotives and try them?

A. Yes, sir.

Q. During what space of time, as near as you can recall, before your application for a patent?

A. Well, I should think probably over two years; probably three years; I couldn't say positive.

Q. What did you find the advantage of a device with vertical slots over other devices tried by you?

A. We found a better draft; more uniform working the fire in the fire box; draft better regulated with the upright bar, and better escape for the gasses and smoke.

Q. In what respect is the grate used by the defendants like your grate?

A. In the openings and placed at the base of the smoke-arch.

82 Q. Does the pipe you have spoken of, surrounding the grate in the defendant's engine, extend all the way around the grate; and, if not, around what part of it?

A. The front. I couldn't say whether it went all the way around or not, but it covered all the front.

Cross-examination by Mr. McCallum:

Q. What like were the spark-arresters you experimented with before you made the invention described in the patent in issue?

A. We placed upright bars in front of the flues in the smoke-arch about six inches from the flue; also tried sheet iron in the smoke-arch; also tried cast-iron grating in the combustion chamber in front of the fire-box; tried wire netting inside; tried wrought-iron bars in the combustion chamber, provided with slots for the expansion of the same. I believe that is up to the present grating in the smoke-arch.

We tried the block opening in this present grate at about $\frac{5}{8}$ of an inch openings in length with the same width. We found it stopped up. When the engine was put in motion it drawed the cinders into those openings and stopped it.

Q. Whose suggestion was the long slot as shown by Exhibit 5 for complainants?
83
A. Me and Mr. Tronson.

Q. Both thought of the same thing, did you?

A. Both worked jointly on it—exchanged ideas.

Q. At what time was this suggestion made—changing the slot?

A. It was during the time of our experiments. I couldn't give dates of that; it is too long ago.

Q. Was it the last form of the grating you tried?

A. It was.

Q. You applied for a patent as soon as you found it all right?

A. No; some little time elapsed.

Q. How long, do you remember?

A. As near as I can place it, from nine months to a year.

Q. When was the first one of this style put into use on a locomotive engine?

A. That date I couldn't give you, but shortly after the patent was obtained; probably three or four months; it might be longer. I couldn't be positive.

Q. Where was it put in use?

A. On what is known as the Morris & Essex division of the D., L. & W. railroad; that is the first it run over the road. It was first tried on the helping engines used in helping trains up the hill.

84 Q. Were they applied to any more locomotives on that road than the one you refer to?

A. To three others; making five running over the road.

Q. Are they still in use?

A. I couldn't say.

Q. Do you know Mr. William H. Lewis?

A. Yes, sir; that is, now master mechanic of that division.

Q. Do you not know that the spark-arresters that you put in use on said road were found to be impracticable, and were ordered taken off by Mr. Lewis because they would not work satisfactorily?

A. I don't know but of one that was ordered taken off, to my knowledge.

Q. Do you know Mr. Andrew Reasoner, connected with said Morris & Essex Railroad Company?

A. Yes, sir.

Q. Did you sell the right to use your patented improvement to the Morris & Essex railroad?

Objected to as not cross-examination.

A. No, sir.

Q. Have you ever sold the right to use it to any railroad company?

A. No, sir.

Q. Have you ever put it on any other engines than the five you referred to?

85 A. Put one on the New Jersey Central railroad; one on the Troy & Whitehall road; that is all, I believe.

Q. Did you get any pay for these last referred to?

A. No, sir.

Q. You put them on as a matter of experiment, I presume?

A. Yes, sir; to try them, to see how they would like them.

Q. Please look at the photograph, Defendant's Exhibit "B" for identification, and state if the spark-arrester there shown is the same as those you saw in use on the Lehigh Valley road.

A. Yes; that resembles the same. The openings are the same as in the blue-print drawing.

Q. Please look at the photograph, Defendant's Exhibit "C" for identification, and state if you have ever seen a spark-arrester of that construction.

A. I can't say that I did.

Q. Same question as to Exhibit "D."

A. No.

Q. The last referred to, Exhibit D, showing a screen of wire netting and Exhibit "C," one having lateral openings. Do you consider that there is any material difference between them and the screens shown by Exhibit "B," with the vertical openings?

86 A. The openings are altogether different. They are all different. "B" has an upright opening; "D," a block opening with wire netting, and "C," a transverse or lateral opening, just the opposite to "B."

Q. Do you consider that the difference in the shape of the opening would make any difference in the operation of the device?

A. Yes.

Q. Please explain why you think so.

A. I think the upright opening is the best for draft, getting the most draft in the same amount of space.

Q. You form this idea from theory, not from practice, I understand?

A. That is my belief from what practice I have had in the matter.

Q. When did you arrive at that conclusion?

A. While experimenting with those spark-arresters.

Q. That was before you applied for the patent?

A. Yes, sir.

Q. Then why, in your application for the patent, did you make oath that the grate is "formed either with bars or of netting or perforated plates. The shape is not material. We make
87 them circucar as being most convenient in ordinary cases"?

A. We showed the upright bar in the model, also in the drawings, and thinking we had a right to stop anything that might be put in there.

Q. You thought at the time that you were the first inventors of a screen of any kind, did you?

A. At that time, yes.

Q. And you were refused a patent on your original claims because you were not the first inventors of such a screen?

Objected to as not the best evidence, the contents of the file-wrapper being the best evidence.

A. I hardly know. The specifications were altered to the upright bar.

Q. Then, is it not a fact that you had to limit yourself to the particular construction of the grate with the longitudinal bars before the patent was allowed, and that the discovery of the peculiar effeciency of that form of grate was not made until after the rejection, and was first inserted in the specification of the patent by amendment after such objection?

Objected to as not being the best evidence, as the record should be produced.

A. I am not aware that the model was altered. It showed the
upright bar, also the specification, I think; but that was
88 altered to the upright bar.

Q. That was all the invention claimed by the original patent, was it not?

A. The circular grate with the upright bar.

Q. In what respect was said original patent of April 11, 1871, inoperative? You can look at the specification of the patent and point out any such defect, if any there may be, in it. (Witness is here shown certified copy of the Patent Office file-wrapper and contents, marked Defendant's Exhibit "E" for identification.)

A. It was on account of the base plate, if I understand, that the grating rested on.

Q. I do not understand your answer. What base plate do you refer to?

A. The flat surface in the bottom of the boiler; that, I think, was one of the causes.

Q. There is no such plate described in the patent, is there, referring to the original patent?

A. I don't think there was. I couldn't say positively, but I think that is one of the reasons the reissue was gotten for—the flat surface.

Q. What were the other reasons, if any, that called for a reissue of the patent?

A. I think that was one of the principal causes. I can't recollect
any other reason.

89 Q. Could not a skilled mechanic make and use a spark-arrester such as is shown and described in the original patent, in your opinion?

Objected to, as it is not shown that the witness is an expert.

A. I don't know what skilled mechanics might be able to do; there are different classes of them. We saw the necessity of stopping sparks and we worked on that line, to prevent escaping sparks from setting fire.

Q. What I mean is, could not a mechanic, from reading your patent, understand how to make and use your invention?

A. I should think so.

Q. Do you consider that the use of spark-arresters like those shown by Defendant's Exhibits "C" & "D" would be an infringement of your patent?

A. In my opinion, I think not.

Q. What makes you think that the use of a spark-arrester like that shown by the blue print would be an infringement?

A. Because of having the upright openings.

Q. Is that all?

A. That is all.

Q. Then the combination set forth in the second claim of the reissue patent is not infringed by the defendant?

90 A. We don't claim that it is.

Q. Then it is only the first claim that you think is infringed?

A. The grate with the upright bars is what we think is infringed.

Q. The claim is for a grating of vertical bars placed at the foot of the spark or petticoat pipe "E" in the manner and for the purpose described. Do you consider that your petticoat pipe marked "E" is the same as the downward extension of the smoke-stack marked "A" in the blue-print drawing?

A. There is a little difference—one is tapering and the other is straight—but they answer the same purpose.

Q. Is not your petticoat pipe "E" open at the upper end, with a space between it and the smoke-stack which is protected by the wire netting "F," and in that respect is it not different from defendant's pipe, as well as being different in its shape?

A. Yes; there is a netting protecting around the top of the pipe that is not shown in the blue-print drawing.

Q. Is there not this further difference, that the defendant's grating is wider at the top than the bottom, while yours is wider at the bottom?

A. Yes; there is that difference.

91 Q. Is there not this further difference, that the openings in defendant's screen break joints so as to present a zigzag arrangement of the openings in it, while in yours they are all arranged in the same circular line or parallel to each other?

A. Yes, sir.

Q. Is there not this further difference in the two screens, that in yours the openings are made by two sets of parallel rods one above the other, while in the defendant's screen there are some five or six sets of openings arranged to break joints as before referred to?

A. There is a difference in the openings. Ours are much longer.

Q. Is there not this further difference, that the defendant's screen has projections from its outer side at points between the openings, while yours has no such projections?

A. Yes, sir.

Q. Is there not this further difference in the arrangement of the two devices, that your screen is located near the bottom of the smoke-arch extending below the lowest flue tube and only up to the third flue tube from the bottom of the boiler, while the defend-
ant's screen extends from about the highest flue to about the
92 second lowest flue? In other words, is not the defendant's
screen located at a much higher point within the smoke-arch
than yours?

A. It is higher, but ours is not so low as the lower tube.

Q. Is not also the defendant's screen supported by the exhaust nozzles at one end and by the smoke-stack at the other, while your screen, as described in the reissue patent, rests upon and is supported by the sheet-iron plate "H"?

A. Yes; yours is supported by the exhause nozzles, a plate cast around the nozzle, and ours rests on a flat surface.

Q. Then, as I understand you, your claim for infringement lays solely upon the fact that the defendant's screen is made with vertical openings. Is that correct?

A. That is correct.

Q. When was Exhibit 5 made?

A. I couldn't tell how long it has been made; it has been made some time.

Q. How many years?

A. It has been made probably 10 years.

Q. Who made it?

A. We had some cast at Hews & Phillips', some at Currier's, some on High street, and some at Roseville.

Q. Were they all made with projecting lugs on the bottom?

A. Yes, sir.

93 Q. These lugs are not shown on the drawings of the patent or described in the specifications, are they?

A. I don't know that they are. I couldn't say. I haven't read it over carefully enough to see that.

Q. Please read it now in answer to the question; and also state if you find anything said in the specification about the screen being made by casting or from casting.

A. I don't see it here. I don't find any description of the lugs or anything relating to castings.

Q. Now, if it were not for the lugs no air could get into the bottom or through the bottom of the screes, could it?

A. No.

Q. And it would not operate well without the air getting in at the bottom, would it?

A. It has operated very well without the lugs.

Q. Do you mean by the screen resting on a plate or without a plate?

A. It would have to rest on a plate.

Q. When did you first begin to use the plate at the bottom?

A. We have always used it, I think, but I don't think it was claimed in the first patent, but I think it was in the reissue, but we have always used it at the bottom.

Q. Did you always use the lugs, too?

A. We cut them off some.

94 Q. I mean at first. Did you use them at the time you applied for the patent—the lugs?

A. I couldn't say as to that, the base plate not being mentioned in the first application, but it was in the second. I think those lugs were used, some with and some without; they gave too much draft at the bottom and drew large cinders up.

Q. How is the bottom of defendant's screen made, do you know? Like the blue-print drawing—open or closed?

A. Plates cast around the exhaust pipe. Those plates are perforated with round holes.

Redirect examination:

Q. You, in your cross-examination, spoke of your device being used on several engines on the Morris & Essex railroad, and that one was ordered taken off; do you know why?

A. The master mechanic, Mr. Lewis, told the engineer running the engine named "Lyke F. Tronson" when that engine come in she would not come out with the grating in. Mr. Lewis claimed the engineer running the engine told him that she didn't steam well; the engineer claimed it to be a falsehood, and a dispute ar*ise* between the two. When I was speaking to Mr. Bartlet, who was
running the engine, that he told Mr. Lewis that the engine
95 didn't steam, and he said it was a falsehood, myself and Mr.
Bartlett got into some words over the matter; he denied
ever saying anything of the kind, and said if I said so I was telling a falsehood also. We had some trouble. Mr. Bartlett reported me to Mr. Lewis and Mr. Lewis dispensed with my services. That is why I knew about the one being ordered taken off.

Q. Were there negotiations between Mr. Tronson and yourself on the one side and the Morris & Essex railroad for the use of this spark-arrester?

A. They thought of adopting it at one time.

Q. Why didn't they do it?

A. They thought that me and Mr. Tronson, being employed by the company, ought to give it to them for nothing.

Q. Do you remember the grounds upon which the patent was reissued, or was that matter left to your attorney?

A. That was left to my attorney; Mr. Malcolmson, I think, had that in charge; he got the reissue.

Recross-examination:

Q. Do I understand you to say in answer to the last question that Mr. Malcomson prepared the application for reissue on his own responsibility?

A. He had charge of it.

96 Q. He prepared it and you and Mr. Tronson signed it?
A. Yes, sir.

Q. And you left it to him to make the alterations that were considered necessary?

A. Yes, sir; I think he made the alterations.

—— ——.

Sworn and examined before me this 6th day of Oct., 1886.

—— ——,
Notary Public.

97 Oliver Drake sworn on behalf of complainants.

Direct examination by Mr. Harris:

Q. What is your age and occupation and where do you reside?

A. My age will be 58 next birthday; occupation, solicitor of patents; residence, Newark, N. J.

Q. For about how long have you been engaged as solicitor of patents?

A. Twenty-odd years.

Q. What was your employment before that?

A. I was engaged in mechanical pursuits prior to that; some portion of the time at the Erie car works, near the Bergen tunnel.

Q. Are you familiar with the construction of locomotives?

A. In a general way; yes, sir.

Q. Have you examined and are you acquainted with the drawings, specifications, and claim in patent of Kearney & Tronson for spark-arresters, reissue No. 5184?

A. Yes, sir; I examined that somewhat carefully several years ago; upwards of three years, I think it was.

Q. You may state what the device therein described is, its use, and your reason therefor.

A. The device described in the claim in the patent is for arresting the sparks and preventing their passage through the 98 smoke-stack. It is termed in the patent "spark-arrester for locomotives." It consists of a grating placed at the lower part of the "petticoat pipe," composed of vertical bars with narrow vertical spaces between them. The claim, first, is for a grating lettered "D," with vertical bars placed at the foot of the spark or petticoat pipe "E" in the manner and for the purpose substantially as described. I understand that claim to be generic in character, so far as it relates to the bars and spaces between them being vertically arranged. The second claim is for the combination of the grating "D" with a wire netting lettered "F" in the drawing. This wire netting is placed near the top of the petticoat pipe "E" and at or near the base of the smoke-pipe and is intended to intercept any sparks that may by any possibility pass the lower grating outside, not going through it, more especially when kindling the fire or when the engine is not in motion.

Q. What do you consider the particular feature of the first claim of the patent?

A. I think that question was answered in my answer to the first question—that is, it seems to be intended to cover broadly a grating,
composed of vertical bars with narrow spaces between them,
99 places at the foot of the spark or petticoat pipe of a locomotive engine.

Q. You may examine Complainants' Exhibits 3 & 4 and defendant's blue-print drawing "A" and state what they represent.

A. They represent a grating composed of vertical bars and openings arranged in substantially the same positions as those described and shown in complainants' patent. The only differences that I note are that the gratings appear to be arranged a little higher in the blue-print drawing than in the complainants' patent, and they are wider at the top than at the bottom than in the patent. Those in the blue print appear also to be supported by what I suppose to be the exhaust pipe, also in Complainants' Exhibit 4. I notice also a difference in the construction of the grating. Those in the blue-print drawing and Complainants' Exhibits 3 and 4 show ties arranged alternately between the bars, whilest in the patent there is but one tie, about in the centre, extending all around horizontally. These differences, however, do not seem to be material. I should judge that the gratings shown in the blue print and Exhibits for Complainants 3 and 4 might be cast iron, while those in the patent may be made of wrought iron. However, I am not certain of that, there being nothing said, as I notice, in the patent about it. I haven't read it through, but I don't notice any reference made to that.

100 At this time, 5 o'clock p. m., the further examination of
the witness on the stand was adjourned till tomorrow, Oct. 7th, at 10 o'clock a. m.

THURSDAY—10 o'clock a. m.

The parties appeared as before, and the witness was examined further as follows:

Q. In your opinion, does the grating, in its construction and arrangement as shown in defendant's blue drawing, Exhibit "A" for identification, and in Complainants' Exhibits 3 and 4, embody the same features as the first claim in the complainants' patent?

A. Yes, sir; there is no doubt in my mind on that point.

Q. Have you ever before testified as an expert in patent causes before the United States courts?

A. I have; frequently.

Cross-examination by Mr. McCALLUM:

Q. Do you find the subject-matter of the second claim of complainants' patent in the drawings or machine represented by the drawings referred to in your direct testimony?

A. I do not find the subject-matter of the second claim in the
blue-print drawing, Exhibit "A," nor in Exhibits 3 & 4, as
101 the petticoat pipe in the blue print and in Exhibit 4 for
complainants appears to telescope into the smoke-stack or

pipe without leaving any opening between the two, in which case there is no need of the wire netting which is shown in complainants' patent and embraced in the combination in the second claim thereof.

Q. Is not the pipe shown by the blue print and referred to in your last answer as closely fitted or telescoping into the smoke-stack practically a downward extension of the stack into the smoke-arch?

A. It may be considered such, and that is true also of the petticoat pipe in complainants' patent.

I might add here, I can see no reason why the petticoat pipe in complainants' patent might not be made to fill the smoke-stack or, rather, that such a construction would make any difference in the operation of the device.

Q. If the complainants' petticoat pipe were made as you suggest, to closely fit the smoke-stack, it wouldn't be the same petticoat pipe described in the patent, would it?

A. In one sense, no, but in another, yes—that is, the operation would be the same in both cases; but the grating or netting "F"
in the case of a close fit of the two pipes would not be needed.

102 Q. If the screen or grating "F" was omitted it would not
be the same device described in the patent, would it?

A If the netting were omitted the combination covered in the second claim of the patent manifestly would not be present; but I cannot see that that would affect the subject-matter of the first claim in any respect.

Q. Is not the petticoat pipe "E" made an element of the combination covered by the first claim?

A. Most assuredly. It is not a combination, however. The claim reads thus: "The grating 'D,' with vertical bars placed at the foot of the sp*ra*k or petticoat pipe 'E' in the manner and for the purpose substantially as described." Now, I do not regard the terms of the claim to be limited in any manner by the shape of the petticoat pipe or by its union or the manner of its union, rather, with the smoke-pipe.

Q. If it is not a combination claim, what sort of a claim is it, in your opinion?

A. I am inclined to think your question involves a question of law; still, I may say that the claim might be regarded, possibly, as a combination claim and yet not be limited by the shape of the petticoat pipe or the manner of its union with the smoke-pipe.

Q. You said in your direct examination that you had not
103 read the specification through. Please now do so and see if
you find therein any suggestion that the pipe "E" may be made to fit the sm*i*ke-stack, or that the grating "F" may be dispensed with.

A. I meant that I had not read it through immediately preceding my being placed upon the stand. I have, however, read it through since. I find the following language in the specifications, to wit: "F" is a netting or grating placed around the top of the petticoat pipe, so as to cover the annular opening caused by the difference in size of the upper part of the petticoat pipe and the bottom of the smoke-stack "G." Now, whilest I find no reference made to omitting the wire netting, it seems to me to be apparent that the inventors intended to apply their invention—that is, the grating "D" placed at the lower part of the petticoat pipe—to locomotives in general; but, finding the construction of the locomotive in respect to the petticoat pipe and smoke-stack to be such as is shown in the drawing of the patent, they hit upon the device "F"—that is, the wire netting—as a means for covering the opening between the two pipes where they connect; hence the incorporation of a second claim in the patent.

104 The latter part of the foregoing answer, in which the witness expresses his opinion of what he supposes the inventor intended, is objected to as non-responsive and irrelevant.

Q. What do you understand by the term "petticoat pipe" in mechanics, and why do such pipes obtain that name?

A. Why they obtain the name "petticoat pipe" I am unable to say, neither can I see the propriety of the name, but I find it in the specification. I will quote the language as follows: "'E' is a pipe extending from within the base of the smoke-stack down into the smoke-box, and commonly termed a 'petticoat pipe.'" I understand this pipe to be a mere extension of the smoke-pipe, or the smoke-pipe an extension of it, as you please, and I see no reason why they should not be closely joined or a space left between them, particularly.

Q. Would it not be a fair interpretation of the language to say that a petticoat pipe obtained its name from its similarity to the garment of such name, being wider at the bottom than at the top, and open at both ends?

A. There is some force and significance in your suggestion.

Q. Can you say why the petticoat pipe shown and described in complainants' patent is made wide at the bottom and narrow at the top?

105 A. I cannot, as I have already intimated. I do not see by the specification any indication that the inventors had anything to do with the construction of a petticoat pipe or with a smoke-pipe, or, indeed, with any other part of a locomotive, but simply took them as they found them. I think that is manifest from the following reading: "A represents a portion of a boiler of a locomotive. B is a space commonly called the smoke-box. C C are the flues at the point where they enter the smoke-box. E is a pipe extending from within the base of the smoke-stack down into the smoke-box, and commonly termed a petticoat pipe." Now, I find no claim whatever to invention in respect of the construction of these parts. As a matter of fact, I should judge from the drawing that the locomotive shown in the patent was an old one at that time, because of the shape of the smoke-stack, which widens toward the top, as the old-fashioned locomotive smoke-stacks used to, while that in the blue print shows a smoke-stack of uniform diameter inside all the wa up.

All of the foregoing answer after the words "I cannot" objected to as non-responsive and irrelevant.

Q. The pipe "E" of complainants' patent does conform in shape
to the definition of "petticoat pipe," as before stated, does
106 it not?

A. Well, I think it does, somewhat.

Q. Suppose the definition of the term "petticoat pipe" be correct, do you find in the blue-print drawing, Defendant's Exhibit "A," or in Complainants' Exhibit 4 a petticoat pipe?

A. Well, yes; somewhat. The same pipe in the blue print and in Exhibit 4 is larger at the bottom than at the top, but the taper is not uniform; but I don't see anything material in that.

Q. You think the shape of the pipe as shown and described in complainants' patent is quite immaterial, do you?

A. Yes, sir. The specification, I think, is clear on that point from the following: "E is a pipe extending from within the base of the smoke-stack down into the smoke-box," and then they add that that particular pipe is commonly termed a "petticoat pipe." It is clear to me that there is no intention there to limit themselves to any particular shape or to any particular differences which may be found in those pipes in different locomotives. In the claim this pipe is termed "a spark" or "petticoat pipe."

Q. Further on in the specification, after describing the difficulties
or objections to such contrivances before in use, the following
107 statement of invention: "In order to overcome these difficulties we place a grating, F (should be D), at or near the ower end of the petticoat pipe E, so as to surround the exhaust pipe I and prevent any cinders or sparks entering the pipe E while owing free passage for the smoke and gasses. We also place a ting or netting, F, around the top of the petticoat pipe to cover aperature left between it and the smoke-stack in order to arrest y sparks or cinders that may be drawn to that point." Do you ot consider that the netting F is here referred to as an important element of the invention described in the patent?

A. I certainly do, in connection with a locomotive of that construction.

Q. Is there any more prominance given to the grating D than to the netting F in this description of the invention?

A. Well, I think there is; but whatever prominance may be given to the netting F, I don't see that it detracts in any way from the importance or from the function of the grating D, nor, in my judgment, would the greater prominance of the grating D detract from the importance or function of the netting F.

Q. Do you think that the inventors are entitled or warrented in
so changing the construction of the pipe E as to dispense
108 with the use of the grating F?

A. Well, I can only infer that they had in contemplation that there might be constructions in which the netting F might be dispensed with, from the fact that they have made a specific claim to the grating D independent of its relation to the netting F. If the two claims had been combined in one, your reasoning would undoubtedly be correct—that is, both the grating D and the netting F would have to be used in combination in order to come within the terms of such claim.

The latter part of the answer, referring to the reasoning of counsel, is objected to.

Q. How do you understand the grating D to be constructed, from the reading of the specification?

A. I should say it was a circular grating or at least conforming to the shape of the petticoat pipe, the bars of which are arranged vertically.

Q. Is it not stated that the grating D is to be made with straight vertical bars of iron placed at small distances apart?

A. It is so stated in the specification.

Q. Is there any other form or method of construction of the grating described in the patent?

109 A. I don't see any other form specified. I see the term "a grating" used in several places in the specification.

Q. Please point out where any other grating than the grating D is referred to as "a grating."

A. I note in the fourth paragraph, commencing on the 7th line, these words: "D is a grating placed at the lower part of the petticoat pipe," &c. Then I find this language in the 5th paragraph: "Our improvements relate to providing locomotives with a suitable device for preventing live coals, cinders, sparks, and like substances," &c. Here the words "suitable device" evidently refers to the same grating. In the first paragraph on the second column, second line, the word- "a grating" occur.

Q. Do these refer to any other than the grating D?

A. The words "suitable device" may refer to both the grating and the netting F, and probably do. The other cases mentio refer only to the grating D.

Q. I now repeat the question whether there is any other form or method of construction of grating described in the patent than the grating D, made with straight vertical bars of iron placed at small distances apart.

A. I see none.

Q. And the grating D is described in the first claim as
110 constructed with vertical bars placed at the foot of the spark or petticoat pipe E in the manner described in the specification. Is that correct?

A. Yes, sir.

Q. You understand the concluding words of the claim, "in the manner and for the purpose substantially as described," to refer to the description of the device in the specification, do you not?

A. In a general way, I do; yes, sir.

Q. Have you had any practical experience with the use of spark-arresters in locomotive engines?

A. No; I have not

Q. Have you ever made any experiments with screens or gratings having different shaped openings?

A. I have not.

Q. Have you ever examined the sparks or unconsumed portions of fuel which are ejected from or retained in the smoke-arch, as to their form, size, &c.?

A. I think I did several years ago.

Q. On what occasion?

A. I was called upon several years ago to make a critical examination of the state of the *arch* with reference to this patent, and I think it was on that occasion.

Q. Of what shape did you find the sparks, uniform or irregular?

111 A. I can't state with any degree of certainty. My impression is that they were irregular.

Q. If you have never made experiments with gratings with openings of different form and knowing the fact that the sparks are of an irregular shape, can you say that one form of opening is better adapted than another for arresting the sparks and retaining them within the smoke-box?

A. Of course, my opinions are based upon theory rather than practice, but I can discern what appears to me to be a manifest advantage in the vertical bars and openings over bars and openings arranged horizontally. In the latter case the strong draft caused by the engine exhausting through the smoke-pipe causes the cinders, which strike with considerable force against the bars, to imbed themselves in the opening and lodge upon the bars, which in that case act as a kind of shelf, and so clog up and impede the draft, whil*e*st in the bars arranged vertically the cinders strike against them and ide upwards until they reach the top, and then fall back without struction to the bottom of the smoke box. I notice, too, that, the aft being strongly upward, the vertical bars and openings offer he least resistance or less resistance than the horizontal bars—that is, as to the disposition of the draft. This may be illustrated
112 by inserting a wire between the vertical bars, when it will be
seen that the wire may be inserted at an angle varying, say, from 45 degrees to 85, whil*e*st in the horizontal bars the wire will be almost horizontal, so that the draft is forced through on a horizontal plane and then is drawn upwards.

Q. In your opinion, the sparks being irregular in shape, would the heavy or light end be upwards when subjected to the force of the exhaust draft?

A. On general principles, I suppose the large end would go up first.

Q. Do you think the heaviest end would go up first instead of the lightest end?

A. I should suppose the heavy ends would go up first. That might be affected, however, somewhat by the amount of friction of the partic*al*s upon the grating. I haven't given the matter any thought.

Q. You think the law of gravitation does not apply in this case?

A. No. I think the law of gravitation has its effect.

Q. If the law of gravitation has effect, would not the lighter end of the spark or particle of fuel be foremost in its upward assent as affected by the exhaust?

A. I am quite clear that when gravitation overcame the force of
the draft the lighter end of the particle in its descent would
113 be uppermost, but I think the contrary would be the case
when the particle is forced upwards by the greater force of
the draft.

Q. Your opinion in this respect is not formed from any practical test, is it?

A. No.

Q. If it should be a fact that the vacuum effect of the exhaust was to draw the particles small end foremost, would they not be more apt to clog a long opening by entering small end foremost and becoming wedged at the thicker end than if they struck or attempted to pass through square openings like those formed by wire netting or lateral openings such as you have referred to?

A. I don't think they would, sir, from the fact that when they struck the lateral opening they wouldn't move, whilest in the vertical opening the tendency would be to slide upwards until they struck some obstacle, when they would be likely to fall off or away from the grating.

Q. Would not the tendency be of the spark to wedge itself more firmly within the opening as moved upwards, the force of exhaust being a suction into the pipe?

A. You may be right, but I think you are wrong. I think the
effect would be in the case of the lateral opening for the par-
114 ticles to strike and wedge themselves fast or be retained by
the inward and upward force of the draft where they struc
whilest in the vertical openings, unless they struck with sufficie
force to wedge themselves fast, so as to resist the inward and upwar
tendency of the draft, they would slide up and *and* be ground away
until they came to an obstruction, when they would fall off.

Q. Please look at Defendant's Exhibits B, C, and D for identification and state if you understand what they represent.

A. Yes, sir; they show the front of a locomotive with the door open, exposing the grating at the bottom of the petticoat pipe.

Q. Is there any difference between the construction of the grating of the several exhibits? And, if so, please state what it is.

A. B shows a grating having the bars and openings arranged vertically, C shows the same with bars arranged horizontally, and D shows the same with the openings square, composed of wire netting.

Q. Do these photographs show sparks or particles of fuel sticking or adhering to the grating?

A. They each of them show specks which may designate
115 particles of cinders or ashes clinging to the grating.

Q. In which of the three do the openings in the grating appear most clogged or choked up by the sparks?

A. Exhibit B appears to show the most, although it is badly blurred. I should think Exhibit D shows the fewest.

Q. Presuming that you had made a test of the three several forms of gratings shown by said photograph exhibits, and that the photographs had been taken immediately after the running of the same engine under the same conditions as to speed and length of run and fuel used, would you still be of the opinion that a grating with vertical openings like Exhibit B was better for the purpose than either of the other gratings shown by Exhibits C and D?

A. If the conditions were in every respect the same, I should be, of course, forced to the conclusion that I expressed in my last answer—that is, that Exhibit B was more clogged than either of the other devices.

—— ——.

Sworn — and subscribed before me this 7th day of Oct., 1886.

—— ——,
Notary Public.

116 *Testimony.*

(Filed December 24th, 1886.)

Evidence for defendant, taken pursuant to agreement of counsel, before John S. Noble, notary public.

SOUTH EASTON, PA., *December* 21*st*, 1886.

Met pursuant to agreement.

Present: Elwood C. Harris, counsel for complainant; Andrew McCallum, counsel for defendant.

ALEXANDER MITCHELL, a witness for defendant, being duly sworn, deposes and says that he is fifty-five years of age, a resident of Wilkes Barre, Luzerne county, in the State of Pennsylvania, and am division superintendent of the Lehigh Valley Railroad Company; I have been with the Lehigh Valley Railroad Company since 1864, and was at the Delano shop in Schuylkill county until April 10th, 1871, and since that time have been division superintendent, as above stated; I am familiar with the construction and operation of locomotives; I have given considerable attention to the operation of spark-arresters, and have taken out four or five patents for different forms of construction; I began to give special attention to the subject of spark-arresters in 1868, but did not take out my first patent until 1875. (Witness is here shown photographs marked Defendant's Exhibits B, C and D, for identification, and says)—I have seen devices like all three of said photographs in use on locomotives; I never saw these photographs before, but I have now examined them, and being asked which, in my opinion, is the best adapted for the purpose, I say Exhibit D; the one showing the wire netting is the best; I experimented with a screen like that shown by Exhibit B in the year 1876; my experience with it was not satisfactory, for the reason that the slots would become clogged and larger particles could get through the holes than with a square mesh or wire screen such as is shown by Exhibit D.

117 Q. 1. Supposing that all three of said photographs were made after careful tests with the same locomotive, with the same amount of fuel and water, and over the same track and the same run, which, in your estimation, would be the best form of spark-arrester?

A. I would prefer one like Exhibit D; Exhibit D has a greater area of escape than either of the others; is less liable to clog and is easier of application than either of the others.

Q. 2. Comparing Exhibits B and C, do you think there is any material difference between them so far as their operation is concerned?

A. I have tried one in the form of Exhibit B, but not of Exhibit C; my opinion is that there would be a greater tendency to clog in Exhibit B than Exhibit C; it is only an opinion.

Q. 3. You say that is your opinion; please look at said photographs and state what are the facts shown by said photographs, presuming them to have been taken under the conditions above stated.

A. Judging from the photographs, the screen in Exhibit B seems to be clogged much more than that in Exhibit C.

Q. 4. Please make the same comparison with Exhibit D, and state what you find in the same connection.

A. Exhibit D seems to be less clogged than either of the others; very much less than Exhibit B.

Q. 5. Then, of the three you think that as a matter of opinion, and as a fact shown by said photographs, that a screen like Exhibit D is the most desirable and best suited for the purpose of arresting sparks in the smoke arch or box of a locomotive engine?

A. I do.

Q. 6. Please look at the drawing now shown you and state that is a drawing of one of the patents granted to you.

A. It is.

Q. 7. (The witness is here shown a copy of patent No. 178,181, granted to Alexander Mitchell May 30, 1876, and his attention is called to the fact that the screen shown by said drawing ap-
118 pears to be made from a perforated metal plate.) In your
opinion is it material whether the screen is made from a perforated plate—that is, from a piece of sheet iron with holes punched in it—or from cast-metal plates, or from netting?

A. I can answer by saying what I prefer, and which I found the best in practice, that is wire gauze.

Q. 8. You have had experience with both the wire gauze and cast-metal plates, such as are shown by Exhibit B, have you not?

A. I have.

Q. 9. And you come to the deliberate conclusion that the wire gauze is the best?

A. I do.

Defendant's counsel offers in evidence the Mitchell patent 178,181 of May 30, 1876, and the same is marked Defendant's Exhibit Mitchell Patent.

Cross-examination (by Mr. HARRIS):

I have been familiar with the construction of locomotives since 1852; I was a machinist and worked in a locomotive shop, first at the Norris locomotive works in Philadelphia, then on the Camden and Amboy railroad at Bordentown for seven years; I was then at the Trenton locomotive works as foreman for two years; I was also master mechanic on the Lehigh and Susquehanna railroad at White Haven, and since February, 1864, I have been with the Lehigh Valley railroad as master machinist and division superintendent.

X Q. 10. Whose device was the screen shown by Exhibit B?

A. In 1876 the Lehigh Valley Railroad Company had ten engines constructed at the Grant locomotive works of Paterson, N. J.; those ten engines were furnished with a spark-arrester similar to my patent, No. 178,181, except that they had a cast-iron screen inside of the lifting pipe below; these cast-metal plates at first, when they came, had round holes in them, which did not meet our expectations; we afterwards tried screens with oblong holes, as shown in the drawing I now produce, in red.

119 Defendant's counsel requests that the drawing produced by the witness be put in evidence, and the same is marked Mitchell's improved spark-arrester.

X Q. 11. The red on this drawing shows a long vertical opening, does it not?

A. It does.

X Q. 12. Were arresters of this pattern put on the ten locomotives above mentioned?

A. They were, the lower screen, but they were removed and netting substituted.

X Q. 13. How long were they in?

A. I don't know that I can give the exact time; I should say they were in from three to six months—long enough to give them a fair trial.

X Q. 14. Were similar spark-arresters ever put in other locomotives of the Lehigh Valley railroad?

A. Not to my knowledge, except in the ten Grant engines.

X Q. 15. Were these put in very shortly after these locomotives were constructed?

A. Yes; to the best of my memory, within a few months.

X Q. 16. Is the construction shown in Exhibit B the same or similar to the arrester you have just called "Mitchell's improved spark-arrester"?

A. The only similarity is that the inner screen of "Mitchell's improved spark-arrester" is the same as the screen shown in Exhibit B.

X Q. 17. Did you refer to this screen, "Mitchell's improved spark-arrester," in your direct examination when you said that in 1876 you experimented with a screen similar to Exhibit B?

A. Yes, sir.

X Q. 18. Have you ever used any other spark-arrester with longitudinal vertical openings?

A. No, sir.

X Q. 19. Are you familiar with the construction of all the engines used by the Lehigh Valley railroad?

A. As to general details, yes; there may be spark-arresters which I know nothing about.

120 X Q. 20. What size of wire is used in the construction of the spark-arrester shown in Exhibit D?

A. I think No. 10 wire; now we use No. 12 or No. 13, and the wire is about $\frac{3}{32}$ of an inch in diameter, and $\frac{3}{16}$ square opening, there being seven openings to two inches; this mesh gives one-half the surface of openings, and is the Pennsylvania railroad standard mesh.

Redirect examination:

R. D. Q. 21. Are you familiar with the spark-arresters used on the eastern division of the Lehigh Valley railroad?

A. I am.

R. D. Q. 22. Can you say if Defendant's Exhibit C is like what is in use?

A. It is.

R. X Q. 23. How long has the company used an arrester like Exhibit C on its eastern division?

A. I have known them in use about three years?

ALEXANDER MITCHELL.

Sworn — and subscribed before me this 21st day of Decembe
A. D. 1886.

JOHN S. NOBLE,
Notary Public.

Lawrence F. Bachman, being duly sworn on behalf of the defendant, deposes and says:

I am thirty years of age, and reside at Wilkes Barre, Luzerne county, in the State of Pennsylvania, and have been a locomotive engineer since August, 1878; I ran locomotive No. 333 *on* the Lehigh Valley Railroad Company between five and six years; at first when I run the engine we used wire-gauze netting.

The witness is here shown Defendant's Exhibit Mitchell's Improved Spark-arrester, and says:

When I was fireman on engine No. 333 that arrangement was in it; I mean with round openings first; then it was changed to
121 elongated openings, like those shown in red on said drawing; then that was taken out and wire netting put in; I find in my experience that the wire netting is the best form, and I prefer

it to either of the castings which are made with round holes or elongated holes; I do not run engine No. 333 now; I run a passenger locomotive, No. 334; my experience as fireman and engineer is that there was not sufficient draft so the locomotive would steam with the round-hole castings; with the casting with long hole, while it would stay open, the engine would steam well, but would clog up in about eight or nine miles; with the wire-gauze netting I found that the engine steamed better than with either of the other forms.

The witness, being shown Exhibits B, C and D, is asked to state which form, in his opinion, is best adapted as a spark-arrester, and says Exhibit D, in his opinion.

Q. 1. Supposing the spark-arrester screen of the different forms shown by said Exhibits B, C and D had been used in the same locomotive experimentally with measured water and coal weighed for each run, and that the run of the locomotive was the same on each trip, and that the photographs were taken immediately after each run, which, as a matter of fact, shows the least clogging or interference with the draft?

A. I should say the wire netting or Exhibit D.

Q. 2. Have you ever seen the photographs B, C and D before?

A. No, sir.

Counsel for defendant offers in evidence the three photographs heretofore marked for identification as Defendant's Exhibits B, C and D, and the same are now marked as exhibits in this case.

Cross-examination (by Mr. Harris):

I began to run engine No. 334 in September, 1884, I think; it had a netting in different from Exhibit D; it was like that shown by "Drawing No. 3," which I now produce.

122 Counsel for defendant offers in evidence the drawing produced by witness, and the same is marked Mitchell's spark-arrester, drawing No. 3, patented May 30th, 1876.

I run on the Wyoming division; I have never run on the Eastern division.

L. F. BACHMAN.

Sworn — and subscribed before me this twenty-first day of December, A. D. 1886.

JOHN S. NOBLE,
Notary Public.

John I. Kinsey, a witness for defendant, being duly sworn, deposes and says:

I am fifty-eight years of age; a resident of South Easton, in the State of Pennsylvania, and am master mechanic of the Lehigh and New Jersey division of the Lehigh Valley Railroad Company; I have experimented with and tried different kinds of spark-arresters in the smoke-head at various times, both wire netting and cast, and with both vertical and horizontal slots.

Q. 1. Did you make any special experiments with different screens for the purpose of this suit; if so, please state what they were?

A. I have made experiments for the purpose of seeing which would work the best, and tried them by running the engine from Easton to Jersey City and back again on a passenger train; after each trial the smoke-head was opened and the screen examined, and a photograph taken of each kind, and we found that the screen of wire netting gave better results than the other two devices.

Q. 2. Please look at the photographs Defendant's Exhibits B, C and D, and state if these are the photographs you refer to, and if the same were taken at the time the experiments you refer to were made.

A. They are the ones, and were taken at the time the experiments were made, which was in 1883.

Q. 3. Did you cause said photographs to be made at that time?

A. I did.

Q. 4. Where?

123 A. At the round-house in the South Easton shops of the Lehigh Valley Railroad Company.

Q. 5. What was the name of the photographer?

A. Richard Devere; and the Exhibits B, C and D were made by him on my order.

Q. 6. What were the conditions of the tests made with these different spark-arresters?

A. I cannot tell the conditions of the tests, but they were made between Easton and Jersey City and return.

Q. 7. What was the object of the tests?

A. To ascertain which would give the best satisfaction.

Q. 8. What was the result of said tests?

A. The engine steamed better with the wire netting, and it did not clog up.

Q. 9. You have experience with the screens made of cast-metal plates, have you not?

A. Yes, sir.

Q. 10. Do you find any difference between the use of cast-metal plates having round holes, or long-shaped holes arranged vertically or long-shaped holes arranged horizontally?

A. I have never used a cast-iron plate with round holes in, but have used cast-iron plates with vertical and horizontal slots; I have used wrought-iron plates with round holes, and found that the wire netting gave the greatest amount of area for draft.

Q. 11. Have you ever used a petticoat pipe with a screen of rods at its lower end for the purpose of arresting sparks?

A. I have not.

Q. 12. Would you call the spark-arrester screen shown by the photograph, Defendan*dan*t's Exhibit B, a petticoat pipe?

A. No, sir.

Q. 13. What do you understand by the term "petticoat pipe" in mechanics—I mean as engineers use it?

A. A pipe that goes down near the bottom of the smoke-arch for the purpose of lifting any dirt or matter that may be in the bottom of the smoke-arch, to create a draft in connection with the exhaust pipes of the engine.

124 Q. 14. As a matter of fact, is there any petticoat pipe used in the smoke arch or arches of the locomotive engines belonging to the Lehigh Valley Railroad Company, so far as you know.

A. We do not use the petticoat pipe on the Lehigh and New Jersey divisions; I do not know what is used on the other divisions.

Q. 15. Do you know whether or not any of Mr. Alexander Mitchell's improvements in spark-arresters are used by defendant?

A. Yes, sir; they are.

Q. 16. To your knowledge has defendant ever used a spark-arresting device like that shown and described in the letters patent granted to Kearney and Tronson, on which this suit is brought?

Witness is here shown a copy of reissued patent No. 5184.

A. Not to my knowledge.

Defendant's counsel offers in evidence blue-print drawing heretofore marked as Defendant's Exhibit A, for identification.

Cross-examination (by Mr. Harris):

X Q. 17. (Witness being shown Defendant's Exhibit A for identification, is asked)—Has the Lehigh Valley Railroad Company ever used a spark-arrester like that shown on this exhibit?

A. Yes.

X Q. 18. How many of them?

A. I could not answer positively; I think I would be safe in saying as many as a dozen; we are not using them now; I think we used some in 1883.

X Q. 19. When did you first use them?

A. I am not positive about the date; I don't think it was before 1870; it was after 1870; I cannot tell the exact date.

X Q. 20. Where were they first put in engines?

A. I cannot tell whether they were put in here or somewhere else first.

X Q. 21. From the time they were first put in, were they used continuously until 1883?

125 A. Yes, sir.

X Q. 22. Does the drawing, Defendant's Exhibit A, show a pipe extending from the top of the smoke-arch downward?

A. It does.

X Q. 23. Is that a petticoat pipe?

A. No, sir.

X Q. 24. Is there such a pipe in the locomotives of the company now in use? I mean a pipe like the one shown in the drawing, Defendant's Exhibit A.

A. There is in some of them.

X Q. 25. Were the spark-arresters shown in the photographs, Exhibits B, C and D, attached to the base of a pipe extending down into the smoke-arch and opening into the smoke-stack at the top?

A. The smoke-stack is extended down into the smoke-arch a foot or eighteen inches and the spark-arrester attached to it at the bottom.

X Q. 26. The escape of steam, smoke, &c., in such a construction, is by entering the extended smoke-stack at its base?

A. Yes.

X Q. 27. In the use of a petticoat pipe, the escape of steam, smoke, &c., is at its base, up through it, and thence through the smoke-stack, is it not?

A. No, sir.

X Q. 28. How, then, is the escape?

A. The escape is by entering at the top of the petticoat pipe into the smoke-stack, where a petticoat pipe is used.

X Q. 29. Will not the exhaust form a strong draft at the spark-arrester, as shown in Kearney and Tronson's patent?

A. It will not form so strong a draft at the bottom as at the top, in said Kearney and Tronson patent.

X Q. 30. In Defendant's Exhibit A, all the draft is through the spark-arrester, is it not?

A. Yes, because it has no other outlet.

X Q. 31. If there were an outlet at the top as in the drawing of Kearney & Tronson's patent, the force of the draft through the spark-arrester would be lessened, would it not?

A. Yes, sir.

126 X Q. 32. If the draft were thus lessened, what would be the effect on the tendency of the arrester to clog?

A. It would clog in that place or in this; the sparks have to go up; I cannot answer your question knowingly.

DECEMBER 22D, 1886.

Met pursuant to adjournment, and examination of witnesses proceeded with in the presence of the same counsel.

X Q. 33. Please examine Defendant's Exhibits A and Mitchell's Improved Spark-arrester—do the red lines on the latter indicate the same construction of spark-arrester as to the cast-iron grating as Exhibit A?

A. They do.

X Q. 34. Were the gratings shown in Exhibit A made under your supervision, and if so, what proportion of the surface of the spark-arrester do the openings comprise?

A. I cannot answer positively, but judge that the openings are less than one-half of the surface; the vertical bar of metal between the openings is wider than the opening-, and the horizontal bar at the end of the openings is about the same as the vertical bar.

X Q. 35. About what was the width and length of each slot?

A. The width of the slot is about three-sixteenths and the length about three inches, more or less, and the joints were broken, as shown in Exhibit A, so that the end of each slot is opposite a piece of solid metal.

X Q. 36. Were all the arresters like Defendant's Exhibit A taken out in 1883?

A. I cannot answer positively; I think they are all out now.

X Q. 37. Were they, or any of them, taken out in the shops under your supervision?

A. Yes, sir; I think all of them.

X Q. 38. Have you any of the castings like Exhibit A?

A. I think I have one set reserved for reference.

X Q. 39. Will you produce it, or a section of it?

127 A. I can.

Witness goes to get the casting, and returning says:

The casting I had reserved was a horizontal instead of a vertical slot; I have sent to see if I could find any pieces with a vertical slot.

Counsel for defendant informs counsel for complainants that, to the best of his recollection, a full-sized cone, or cones, showing both the lateral and vertical slots, were shipped from South Easton to Trenton, N. J., in the spring of 1883, when it was anticipated that a motion for injunction was about to be made in this case.

Counsel for complainants gives notice to counsel for defendant that he desires said cones to be produced when found, and to use the same on final hearing.

And to which counsel for defendant replies that if the cone or cones referred to have been lost or mislaid in this court, that he will produce either duplicates or sections of the castings referred to.

Witness at this stage produces a portion of a casting which is a section of a screen formerly used on defendant's road, and the same is offered in evidence by complainants and marked Complainants' Exhibit Defendant's Grating.

X Q. 40. This casting just produced is not identical with the castings forming the spark-arrester in Exhibit B, is it?

A. No, sir; the screens used in the front part of cone in Exhibit B have projections or knobs cast upon them; the section of casting which I have produced does not have those knobs; I think that it was only the front part of the screen that had them.

X Q. 41. When did the company on the Lehigh and New Jersey divisions first use a wire screen of the form shown in Exhibit D?

A. In 1877, and is still in use on most of the locomotives.

X Q. 42. How long will such a screen last in a passenger locomotive constantly used?

A. I think about two years or more.

128 X. Q. 43. Do you know about how long a screen like Complainants' Exhibit Defendant's Grating would last under like conditions?

A. It is not safe to use it more than one year.

X Q. 44. Then during the time such a grating was used you renewed them about every year?

A. It was our custom not to use them over a year.

X Q. 45. About how many locomotives were in use on the Lehigh and New Jersey divisions in the spring of 1883?

A. Fifty or more.

Redirect (by Mr. McCallum):

Q. 46. Will you please look at Complainants' Exhibit Kearney and Tronson Patent and state if you understand same.

A. I understand it to be a petticoat pipe, with bars at the bottom, and resting on a plate of iron, and at the top of the smoke-arch the petticoat pipe enters the smoke-stack, leaving an opening between the petticoat pipe and the base of the smoke-stack, around which there is a netting or screen attached to the petticoat pipe and the top of the smoke-arch.

Counsel for complainants objects to the testimony unless it is shown that the witnees is an expert in patent matters.

Q. 47. Please state what your experience has been with letters patent and their construction.

A. I have taken out patents myself for different things and used them, and furnish specifications and drawings for my patents.

Q. 48. Are you familiar with and able to read the specifications and drawings of letters patent such as the said Complainants' Exhibit Kearney and Tronson Patent?

A. I am.

Q. 49. You have referred in a previous answer to a screen made of vertical bars, as described in said patent; what is your understanding of the language used, and the drawings, so far as they show and describe that feature.

A. The way I understand it is that there are pieces of iron run-
ning from the bottom of the petticoat pipe down to a plate for
129 the purpose of keeping the sparks from going through; and
at the top of the petticoat pipe there is a similar arrangement
of netting to allow the steam and gases to pass through into the
smoke-stack, and this arrangement encloses the exhaust pipes from
the cylinders.

Q. 50. Suppose you should want to have a contrivance made like that described in said Kearney and Tronson patent, what instructions would you give to the skilled mechanics under your charge—I refer only to the screen portion of the device at the bottom?

A. I would tell them to take a petticoat pipe and fasten wrought-iron bars to it, equally distant apart, with a ring or plate around the rods to hold them in position.

Q. 51. Would anything in said patent, either described in the specification or shown by the drawings, instruct you to use a thing like Complainants' Exhibit Defendant's Grating?

A. No, sir.

Recross (by Mr. Harris):

Re-X Q. 52. Is it stated in the patent, or indicated in the drawing, that wrought iron should be used for the grating?

A. Well, I think it does; it says vertical bars of iron, that's all; the drawing indicates wrought-iron bars.

R.-X Q 53. How?

A. By the length of them, and because there is nothing to stay them or hold them in position, which would be necessary in casting.

R.-X Q. 54. To your mind what does the black horizontal line half way up the grating indicate?

A. It indicates a wrought-iron ring with holes through it for the bars to pass through.

R.-X Q. 55. Is the outside diameter of this ring, as you call it, greater than the outside diameter of the arrester?

A. I don't know.

R.-X Q. 56. Does it appear greater on the drawing?

A. It does not show so; that line is not lettered, and is not mentioned in the specification, that I see.

J. I. KINSEY,
M. M. L. V. R. R. Co.

130 Sworn to and subscribed to before me this 22d day of December, A. D. 1886.

[L. S.] JOHN S. NOBLE,
Notary Public.

Monroe D. Musick, being duly sworn on behalf of defendant, deposes and says:

I am thirty-six years of age and reside at South Easton, Northampton county, in the State of Pennsylvania, and have been a locomotive engineer since 1878; I run engine No. 371 on the Lehigh Valley railroad called the "J. H. Wilhelm;" the name is painted on the engine.

Q. 1. Do you remember making experiments with spark-arresters on said engine in the spring of 1883?

A. I do.

Q. 2. Will you please state what these experiments were, how they were conducted, and what were the results, so far as you know?

A. The experiments were in trying different kinds of spark-arresters; the coal was weighed and the water was as usual, but not measured; I made three tests with three different spark-arresters; after each experiment the spark-arrester netting was examined, and I heard that photographs were taken, but as to that I have no personal knowledge.

Q. 3. Did you personally examine the spark-arresters after each test?

A. I did.

Q. 4. Will you please state what different kinds of spark-arresters were used on these tests?

A. The first one was a cast-iron netting put in in six pieces in cone shape with the vertical slots; the next one was a wire netting of the same shape as to the cone; the third one was a cast-iron netting of the same shape with slots running horizontally.

Q. 5. Please look at the photographs now shown you, marked Defendant's Exhibits B, C and D, and state whether or not they represent the kinds of screens or spark-arresters you have been speaking about.

A. They do; Exhibit B is the first one, D is the second one, and C is the third one.

131 Q. 6. Do you remember what, if any difference, there was in the use of those different screens, so far as the running of the engine is concerned, in draft and clogging up of the screens?

A. The first one with the slots vertical would block up, especially in running a long distance, without shutting off steam; the longer the run the more it would block up; the second one with wire netting would not block up more on a long run without shutting off steam than on a local run; the third one with the slots horizontal would not block up enough to be a detriment to the engine's draft, no matter how I run the engine or on what run.

Q. 7. From your experience and to the best of your judgment, which is the better form of the slot in the casting of such screens, the vertical or lateral?

A. The horizontal or latARAL opening is the best.

Q. 8. What about the wire netting—do you think from your experience that it is better or worse than the cast-metal plates in either form as spoken of in your last answer?

A. I think the horizontal form of slot is the best, that is, if put in in the same way as shown in Exhibit C.

Cross-examination (by Mr. HARRIS):

X Q. 9. On how many trips have you used each of the spark-arresters shown in Exhibits B, C and D?

A. On two trips, back and forth between Easton and Jersey City.

X Q. 10. When did you begin to run engine No. 371?

A. January 26, 1882; the engine had been run a couple of months before that.

X Q. 11. What spark-arrester was in the engine when you commenced to run it?

A. A cast-iron netting, with a vertical slot.

X Q. 12. Was it the same as shown in Defendant's Exhibit A, now shown you?

A. About the same; yes.

X Q. 13. When was that spark-arrester taken out?

A. In the spring of 1883.

X Q. 14. Were the experiments of which you have spoken made on the same engine, No. 371?

132 A. Yes, sir.

X Q. 15. Within what length of time were the three arresters put in and tried?

A. All in the same week.

X Q. 16. In the first experiment with vertical slots was the same arrester used that had been in the engine from the time you commenced running it?

A. Yes, sir.

X Q. 17. With this arrester, when the experiment was made, did you clean off the coals or cinders which clogged it during the trip?

A. Yes, sir, we had to stop one day, because it clogged up so that the engine had no draft and got low in steam.

X Q. 18. Had you complained of a similar difficulty before the time when these experiments were made?

A. Yes, sir; I had, frequently.

X Q. 19. Do you know whether other engines of the company had the same arrester, with vertical slots, at the time?

A. Yes, sir; some others I know of.

X Q. 20. How many?

A. To my personal knowledge, about a dozen.

X Q. 21. What form of spark-arrester was put in your engine, No. 371, after the experiments, and what form is now in it?

A. After the experiments, the cast-iron netting with horizontal slots was put in, like that shown in Defendant's Exhibit C, and used about two years; and then the netting like Defendant's Exhibit D was put in, and is in now.

X Q. 22. In the construction of the arrester with vertical slots, were the openings of the slots wider on the outside, or the inside, of the cone?

Objected to as unintelligible, by counsel for defendant.

A. I understand the question; the opening on the inside was wide.

Redirect (by Mr. McCallum):

R. D. Q. 23. Did any one ride on the engine with you during the experiments which you have testified about?

A. Yes, sir; one way.

133 R. D. Q. 24. Do you remember his name?

A. I do not.

R. D. Q. 25. Was it not a gentleman named Brevoort?

A. I don't remember his name.

R. D. Q. 26. Do you remember what kind of a man he appeared to be, as to complexion, hair, &c.?

A. He was light-complexioned, and had reddish hair.

MONROE D. MUSICK.

Sworn and subscribed before me this 22d day of December, A. D. 1886.

JOHN S. NOBLE,
Notary Public.

UNITED STATES OF AMERICA,
State of Pennsylvania, County of Northampton, } *ss:*

I, John S. Noble, a notary public in and for said county, duly appointed and commissioned by the governor of said State, do hereby certify that the foregoing are the proofs for final hearing, taken before me, in the cause in the caption named, on the part of defendant, under and in pursuance to the 67th rule of the Supreme Court of the United States, in equity, as amended.

Witness my hand and official seal, at South Easton, in the county aforesaid, this 22d day of December, A. D. 1886.

[L. S.] JOHN S. NOBLE,
Notary Public.

134 United States Circuit Court, District of New Jersey.

FRANCIS KEARNEY and MARY F. TRONSON
against
THE LEHIGH VALLEY RAILROAD COMPANY.

Testimony taken before me, George W. Weiffenbach, at my office, No. 206 Broadway, New York city, this 25th day of February, 1887, at 2 o'clock p. m., in the presence of Elwood C. Harris, counsel for complainants, and Andrew McCallum, of counsel for defendant, said testimony being taken in accordance with agreement between counsel and on behalf of the defendant.

Counsel for defendant offers in evidence certified copy of file-wrapper and contents, application for patent granted to Francis Kearney and Luke F. Tronson, April 11, 1871, No. 113,528, for improvement in spark-arresters for locomotives, the same being marked Defendant's Exhibit E, George W. Weiffenbach, dated February 25, 1887.

Also file-wrapper and contents, application for reissue of patent to Kearney and Tronson, dated December 10, 1872, No. 5184, the same being marked Defendant's Exhibit F, George W. Weiffenbach, dated February 25, 1887.

Also certified copy of letters patent No. 2143, granted to Leonard Phleger, June 26th, 1841, marked Defendant's Exhibit G, George W. Weiffenbach, dated February 25th, 1887.

Certified copy of letters patent No. 17884, granted to Ethelred May, July 28th, 1857, marked Defendant's Exhibit H, George W. Weiffenbach, dated February 25th, 1887.

135 Certified copy of letters patent No. 33114, granted to James L. Vauclain, August 20th, 1861, marked Defendant's Exhibit I, George W. Weiffenbach, dated February 25th, 1887.

Certified copy of letters patent No. 110,315, granted to Weidman, Major and Sample, December 20th, 1870, marked Defendant's Exhibit K, George W. Weiffenbach, dated February 25th, 1887.

Certified copy of letters patent No. 38992, granted to Allen S. Sweet, Jr., June 23d, 1863, marked Defendant's Exhibit L, George W. Weiffenbach, dated February 25th, 1887.

Certified copy of letters patent No. 106,515, granted to James Smith, August 16th, 1870, marked Defendant's Exhibit M, George W. Weiffenbach, dated February 25th, 1887.

Certified copy of letters patent No. 112,506, granted to James Smith, March 7th, 1871, marked Defendant's Exhibit N, George W. Weiffenbach, dated February 25th, 1887.

Henry L. Brevoort, a witness called for defendant, being duly sworn, testifies as follows:

1 Q. Please state your name, age, residence, and occupation.

A. I am thirty-eight years of age; I reside in the city of Brooklyn, and I am an engineer by profession.

2 Q. Please state what, if any, experience you have had as an expert in patent suits in the United States courts.

A. I have, since about 1871 or 1872, been almost exclusively occupied in examining patents and patented devices, and I have been, during this period, very frequently called upon to testify as an expert witness before the circuit court of the United States, both in this and other circuits, in suits relating to patents. I have been so called in about four hundred cases. As a boy I learned the trade of a machinist in a machine shop.

3 Q. Have you examined and do you understand letters
136 patent No. 113,528, granted to Francis Kearney and Luke F.
Tronson, April 11th, 1871, for improvement in spark-arresters for locomotives?

A. I have very frequently read the patent inquired about in the question, and I think that I understand what is there described and claimed.

4 Q. Have you also examined the reissue of said patent dated December 10th, 1872, and numbered 5184?

A. I have, very frequently.

5 Q. Will you please compare said reissue patent with said original patent and state what, if any, differences you find between them?

A. The specification of the original contains a disclaimer in the following words: "We disclaim all draught-regulating contrivances, and also all gratings with lateral, adjustable openings." I do not find this disclaimer in the specification of the reissue. In the original patent, underneath the grate marked D, a line is shown. Nothing is said about this in the patent, and the line does not appear to indicate anything. In the reissue, this line has been altered so that it represents something, and that something, according to the specification of the reissue, is a piece of boiler plate. I will quote from the specification of the reissue the portion that has been inserted therein and which is not in the original patent. It is as follows: "H is a piece of boiler plate or sheet iron placed at the bottom of the smoke-box in order to provide a flat surface for the grate D to rest upon, and is provided with holes through which the exhaust pipes I I pass." The portion which I have quoted, as I have before said, does not appear in the original, and the piece of boiler plate referred to in the reissue is not in the original.

In the original patent there was one claim which was as follows: "The grate D, with longitudinal bars, as and for the purposes specified and shown." In the reissue this claim appears with a slight change, and another claim has been added which is as follows: "The combination of the grating D, with the netting F, in the manner and for the purpose substantially as described." This claim was an
addition when the reissue was taken out and it claimed a
137 subject-matter which was not claimed in the original patent.

6 Q. What do you understand to be the invention claimed by the first claim of the reissue patent?

A. The patent in suit is a patent for a spark-arrester for locomotives. The spark-arrester described consists of what the patent calls a grating combined and attached to a petticoat pipe. The patent says as follows about the grating: "We construct the grating D with straight vertical bars of iron, placed at small distances apart, but these spaces should be such, in the aggregate, as will be sufficient for the draught and escape of the smoke on kindling the fire, or when the engine is not in motion." The drawing shows these bars as attached to the petticoat pipe. The petticoat pipe is one of the ordinary description, open at both ends and conical. The pipe, near its upper portion, is attached and held by a screen, marked F. At the lower portion in the reissue the grating is shown as resting upon the piece of boiler plate, which apparently is perforated with a hole about the size of the lower part of the grating. The claim in controversy is the first claim, which reads as follows: "The grating D, with vertical bars placed at the foot of the spark or petticoat pipe E, in the manner and for the purpose, substantially as described."

This claim, as I understand it, is for a combination of parts. The first element of the claim being the grating D having the vertical bars, which grating is located at the lower portion of the petticoat pipe E, which is the second element referred to in the claim, and I think the invention claimed is the combination of a grating thus made with vertical bars attached to the bottom of a petticoat pipe. By the terms of the patent I understand that a petticoat pipe as such is a necessary part of the invention of the said first claim; the pipe being a petticoat pipe of the ordinary description, conical in form and open at both ends. This is my understanding of the invention covered by the first claim. The patent points out certain advantages which it says are obtained by the use of a grating of this class,
describing it as used in combination with the petticoat pipe.

138 7 Q. Please compare Defendant's Exhibit E, the same be-
ing the file-wrapper and contents of the application for the original patent No. 113,528, with the patent as granted, and state what, if any, difference you find between them.

A. I will call attention to the most important differences which exist. In the original application, as sworn to by the inventors, I find the following statement: * * * "Formed either with bars or of netting or perforated plates, the shape is not material. We make them circular, as being most convenient in ordinary cases. It is best there should be a clear space on all sides, or around the grate." This quotation, from the original application, shows that the inventors, when they swore to their application, deemed a netting, round hole, and vertical openings as all equivalent for one another in the structure. In the reissue in suit they only refer to the grate D, when provided with the vertical opening formed between the straight vertical bars of iron placed at small distances apart. In the original application there were two claims, which were as follows: “1. The grate D, pipe E, the net or grate F, as and for the purpose specified and shown. 2. Combining a spark-arrester with the smoke-head of a locomotive in the manner and for the purpose hereinabove set forth.” In the original and in the reissue patents the claims, as first applied for, are not found, but different claims have been substituted for them.

8 Q. Do you find in said Exhibit E, that under authority of the inventors, the original application was changed so as to strike out the claims originally made, and the statement of invention referred to, and that changes as to the specification and claims were made before the patent was issued?

A. Yes.

9 Q. Please examine Defendant's Exhibit F, the same being file-wrapper and contents in the matter of the reissued letters patent 5184, comparing the same with said reissued patent as granted, and state what, if any, differences you find between them material to the issue.

A. I have examined Defendant's Exhibit F, and I find in the original application for the reissue that the following sentence occurred: “In the construction of the grating E we prefer to
139 use vertical bars as shown in the drawing, but any style or
kind of grating may be used that will prevent cinders or sparks from entering the petticoat pipe, such as a perforated surface or a grating formed in any manner desired, and the apertures or perforations may be regulated, in size and area of surface covered, by the amount of opening required for the regular draught and escape of smoke on kindling the fire or when the engine is not in motion.”

From the above it is evident that the inventors, when they applied for their reissue, considered that the grating would be substantially the same whether it consisted of the vertical bars which they preferred, or of a perforated surface or indeed of a grating formed in any desired manner. All the forms of perforation they thought of would be substantially the same, and would give substantially the same result; at least they included all possible forms in their application as equivalent. The quoted extract from the original reissue application which I have just given was subsequently stricken out, and it does not appear in the specification of the reissue as granted. The claims of the reissue application as originally filed were two in number; the first was for placing a grating in a smoke-box of a locomotive to prevent the sparks or cinders entering the petticoat pipe, and the second was for the combination of the grating D with the upper netting at the top of the petticoat pipe. These claims were subsequently erased and new claims were added, and finally the claims were brought into their present form;

the office having referred the applicants to a number of prior patents relating to this art.

10 Q. From the history of the application for the original patent and for the reissue patent, as shown by said Exhibits E and F, do you consider that the patent covers any form of grating, or is its scope limited to a grating of the particular construction described, that is, made of longitudinal bars arranged vertically, with spaces between them, and such grating being attached to the bottom or lower end of a petticoat pipe such as you have referred to?

A. The patent is clearly limited to a grating composed of vertical bars, with spaces between them, the bars being attached
140 at their upper end to the bottom of a petticoat pipe. This
is clearly the meaning of the patent which is to be placed upon it, and the history of the application, I think, makes this fact clearly evident.

11 Q. Please look at model now shown you, and state if same is made substantially in accordance with the device described in said reissued patent numbered 5184.

A. I have examined the model. I think it is a correct representation of that which is shown in the reissue.

12 Q. In what respect, if any, does said model differ from the device described in said original patent numbered 113,528?

A. It differs from the original in that the model has, at the lower part of the grating D, a plate running across the lower portion of the smoke-box upon which the grating rests. No such plate is shown or described in the original patent.

Counsel for defendant offers the model referred to in evidence. Marked Defendant's Exhibit Kearney and Tronson Spark-arrester.

Adjourned to meet at the same place on Saturday, February 26th, 1887, at 11 a. m.

Met pursuant to adjournment at 11 o'clock a. m., February 26, 1887.

13 Q. You have referred to the construction of the device described in reissued patent No. 5184; have you any practical experience with the use of spark-arresters; if so, please state what you did or saw with relation to the use of such devices.

A. I have had personal experience with spark-arresters and have made a number of experiments in relation thereto. I will detail the experiments. The experiments were made on the Lehigh Valley railroad engines. The first experiment which I made was with an engine having a spark-arrester constructed like the one shown in Defendant's Exhibit A, a photographic representation of which is shown in Defendant's Exhibit B. This is the spark-arrester which
is claimed by the complainants to infringe the reissue in suit,
141 or rather the first claim thereof. I made several runs with
this engine and examined the smoke-box frequently during the run when the train was at the station. The engine steamed freely, but at the end of the run the grating was considerably

stopped by sparks which were wedged in principally at the upper portion between the bars. Exhibit B represents fairly well the appearance of the engine after a run, say from Easton to New York. I then, upon the same engine, used in place of the spark-arrester shown in Exhibits A and B, a wire netting as a spark-arrester having square openings of about three-eighths of an inch each way. This grating worked well and gave perfect satisfaction. At the end of the run of about one hundred and fifty miles I examined the grating, and also during the course of the run, and I found that the grating was not stopped up by cinders, as had been the grating with the vertical opening as shown in Exhibit B. The photograph Exhibit D shows the condition of the grating after a run, and conforms with the condition that I saw the grating in when a run had been completed. Next, with the same engine, I tried a spark-arrester, such as is shown in the photograph Exhibit C. This spark-arrester had horizontal openings, as shown by the photograph. After running with this spark-arrester in the smoke-box, I concluded that it was the best form of the three which are used, and after a long run there were but few cinders wedged in between the bars. The photograph Exhibit C is a correct representation of the condition of the spark-arrester after a long trip, and it will be seen when the photographs are compared that Exhibits C and D show that fewer sparks became wedged in between the bars than in Exhibit B, in which latter exhibit the openings were vertical. The wire-gauze netting appeared to arrest and keep in the smoke-box the greater number of sparks, for I noticed that the smoke-box had more masses of unconsumed fuel in it after the run when this grating was used than when any other grating was used. The reason that the grating with the vertical slots in it became so obstructed with cinders, I think, is due to the following causes: I took out some cinders or particles of unconsumed fuel in each case, and that they were very irregular in
142 form, of all kinds of shapes, and, reflecting on this fact, I under-
stand clearly why it was that the wire netting arrested more than the grating with long openings, as it was evident to me that long narrow-shaped cinders might readily pass through the elongated openings when they would be arrested by the netting. The irregular form of the sparks also explains to me the reason why the grating having the vertical openings first referred to got choked up more than the others. The draft being upwards, wedge-shaped sparks would be drawn upwards, point foremost, and the small ends entering the slots, the upward force continuing, they would stick fast if their larger end was wider or greater than the width of the opening, and each successive blast of the draft would wedge them more tightly. Whereas, in the netting having square openings, the length of the spark being greater than the width of the mesh, the motion being upward, it would strike the bars of the netting at both ends, and either be broken or else fall back into the smoke-box. The effect would be the same with the later*na*l openings, considering the upward movement of the sparks, and sparks of this form naturally move with their heaviest end downward.

In any spark-arresting grating having vertical slots, more cinders will be caught and wedged than with a grating having horizontal slots, and the reason is this: When a cinder strikes the grating at or near the base of one of the slots, the draft carries the cinder upward in the slot to the top, and if any part of the cinder is sufficiently small it will get firmly wedged in the opening. Now, with a grating having square or horizontal openings, there is no such tendency to carry the cinders up along the outer surface of the grating, and, if they fail to pass through at once, they drop back into the bottom of the smoke-box at once, whenever there is a cessation of the draft.

So far as the draft was concerned, all of the spark-arresting gratings appeared to give equally good results, with the exception that the grating first referred to, having the vertical slots, became choked, and towards the end of the run somewhat interfered with the draft.
No benefit was found to exist in favor of the vertical slots
143 over the square openings or the horizontal slots, either as a
means of arresting the sparks or for securing draft, and in
the latter respect the vertical openings appeared to be the least advantageous. I now produce a box of cinders which I took from the engines during the trial runs.

The box of cinders referred to is offered in evidence by counsel for defendant, marked Defendant's Exhibit "Retained Cinders."

14 Q. Mr. Oliver Drake, complainants' expert witness, says, in referring to the movements of such particles of unconsumed fuel under pressure of the draft in locomotive smoke-boxes that the large end would go up first. Do you agree with Mr. Drake in this opinion; if not, please give your ideas of how such particles or unconsumed fragments of fuel will operate under the circumstances referred to in the question?

A. The particles would go up, I should think, point foremost, and I, consequently, do not agree with Mr. Drake in his views in this regard. However, for the moment assuming that Mr. Drake is correct, if the particles went up with their large end and struck the vertical slots under the influence of the draft they would roll around until they wedged in the slots of the spark-arrester, if those slots were vertical.

15 Q. Mr. Drake says in this regard, "I am quite clear that when gravitation overcame the force of the draft the lighter ends of the particle in its descent would be uppermost, but I think the contrary would be the case when the particle is forced upward by the greater force of the draft;" in your experience, and with your knowledge of the subject, do you consider that the law of gravitation is suspended when a particle is subjected to an artificial draft or upward current of air so that the heaviest end of said particle would be uppermost?

A. No; of course the law of gravitation would hold good under any such circumstances and the particle would fly upwards point foremost.

16 Q. Such being the case, is there any advantage in having a long

vertical slot in a grating such as is shown in complainants'
144 reissued patent, or by Complainants' Exhibit No. 5, over a
grating having lateral slots or a wire grating having rectangular slots, or a grating having short vertical opening- like those shown in Defendant's Exhibit A?

A. There is no advantage in having the long slot vertically arranged, but on the other hand there is a decided disadvantage, the best spark-arrester being made with gratings, the openings in which are either circular, rectangular, or in the form of horizontal slots, as is shown in Defendant's Exhibit C. With the long vertical slots there is a greater tendency to choke than with any of the other forms, as I have before explained.

17 Q. Does Defendant's Exhibit A show this spark-arresting device you saw in use on engines Nos. 363, 371 and 356 on defendant's road?

A. Yes.

18 Q. Please examine said Exhibit A and compare the same with complainants' patent, Exhibit No. 1, and state if you find the invention described and claimed in said reissued patent embodied in the construction shown by the drawing Defendant's Exhibit A, and the photograph Defendant's Exhibit B, giving your reasons for any opinion you may express.

A. I have made the comparison called for by the question, and I am of the opinion that the invention claimed in the first claim of the complainants' patent is not found or contained in a device such as is represented in Defendant's Exhibit A and Defendant's Exhibit B. I will give my reasons for this opinion. The first feature or element referred to in the claim in controversy is the grating D, with vertical bars. In the defendant's structure there is no such grating, but there is, on the other hand, a grating made up of short vertical slots, only about three and a quarter inches in length, which none of them run the entire height, or even half the *the* height of the spark-arrester. It takes five of the short slots of the defendant's structure, with the accompanying cross-pieces, to make up the height of the defendant's device. Neither in the defendant's device is the grating made of vertical bars, but it is a casting, having slots in it, which slots, it is true,
are longer vertically than they are horizontally, but
145 which slots are not spaces formed between and by vertical bars arranged close together. I now produce a small piece of one of the defendant's spark-arresters, showing the slots which I referred to, and it will be seen that the spaces are not formed by a series of vertical bars arranged close together, but the device consists of a single casting, with slots or openings in it, longer vertically than they are horizontally. The second device referred to in the combination of the claim is the petticoat pipe E of the patent. In the complainants' patent a petticoat pipe is shown; that is a pipe conical in form, open at both ends, and smaller than the chimney orifice at the upper end. In this way a draft is induced up through the petticoat pipe and into the chimney, and this draft also induces another draft through the tube up through the smoke-box, and

around the upper edge of the petticoat pipe and between it and the stack. This is the function of a petticoat pipe, to produce these two lines of draft from the smoke-box, one through the grating D and up through the petticoat pipe, and the other from the smoke-box around the outer and upper edge of the petticoat pipe, and as shown in complainants' patent through the grating F. In the defendant's structure, as shown by Exhibits A and B, there is a spark-arrester arranged at the lower end of a downward extension of the stack into the smoke-box; all the products of combustion in this case are forced to go upward through the spark-arrester, and through the downward extension of the stack, which in Exhibit A I letter S in red ink. Now, I am fully aware of the fact that this downward extension of the stack performs one of the functions of a petticoat pipe; that is, the blast from the exhaust nozzles, — is conducted upward by this downward extension and thrown into the stack by the other function of creating a draft from the smoke-box into the stack around the exterior of the upper end of the petticoat pipe, and which is an essential feature of a petticoat pipe, is not present in a structure such as is shown in Defendant's Exhibits A and B; but, on the other hand all the material that passes into the chimney, whether it be small sparks, smoke, or steam, has to pass from the interior of the spark-arrester up into the stack, and all contents of the
146 smoke-box that go out of the stack have to pass through the spark-arrester located at the lower end of the downward extension of the stack marked S in Defendant's Exhibit A. Therefore, I do not think that the defendant's apparatus has either the grating of the patent made up of vertical bars "placed at small distances apart," and neither has the defendant's apparatus a petticoat pipe within the smoke-box within the terms, as I understand it, of the Kearney and Tronson invention, and for these reasons I do not think that the defendant's apparatus contains the invention of the first claim of the said patent.

Counsel for defendant offers in evidence the part of defendant's screen referred to in answer to last question, the same being marked Defendant's Exhibit Lehigh Valley Railroad Screen No. 1.

19 Q. Please examine the portion of a cast screen now shown you, and state if that compares with the screen shown by Defendant's Exhibit C, respecting which you have testified.

A. It is a portion of a screen identical with that shown in Defendant's Exhibit C, respecting which I have testified.

20 Q. Please also to look at the specimens of screens now shown you and state if the same are substantially in accordance with the construction of a screen shown by Defendant's Exhibit B, respecting which you have testified.

A. They are, with the exception that one is a casting and the others are netting, but they all present square or rectangular orifices.

Counsel for defendant offers the specimens referred to in evidence, the same being marked respectively Defendant's Exhibit Lehigh Valley Railroad Screen Nos. 2 and 3.

21 Q. I will ask you to look at Complainants' Exhibit No. 5 and state if the casting thereby represented is described in complainants' patent in issue, or if any casting of such or any other form is described in such patent.

A. I have examined the casting, Complainants' Exhibit No. 5, and I do not find that the complainants' patent shows or describes such a casting; in fact, it does not show or describe any 147 casting whatsoever, but says as follows: "We construct the grating D with straight vertical bars of iron, placed at small distances apart."

22 Q. What do you understand by the use of the expression "straight bars" as set forth in the patent, and shown by the drawings of the same?

A. I understand that the inventors have referred to independent bars of iron which are in some way to be fastened to the bottom of the petticoat pipe, and in the reissue, though not in the original, these bars are shown as likewise fastened to the piece of boiler plate at the bottom of the smoke-box in some way not illustrated in the drawings.

23 Q. Do you consider that the longitudinal or straight bars described in the patent as a means of arresting the sparks are the same in construction and effect as a screen made like Defendant's Exhibit Screen No. 1? Please give your reasons for any opinion you may express.

A. They are clearly not the same in structure as the defendant's device, in which there are no long slots, but short slots only, as I have said, a little over three inches in length. As to precisely how the long slots of the patent would operate I cannot definitely tell because I have never experimented or driven an engine having a spark-arrester of that nature, but my opinion would be that in the use of such device the spaces between the bars would be liable to choke up by the cinders getting wedged between the vertical bars.

24 Q. Please examine letters patent Defendant's Exhibits G, H, I, K, L, M, and N, and state what inventions are therein shown and described, and what, if any, relation they bear to the device shown and described in complainants' reissued patent No. 5184.

A. I will refer to them in the order of their date. Defendant's Exhibit G is a patent granted to Hubbell, in 1841, for a spark-arrester No. 2143. This shows the front of a locomotive with the two exhaust nozzles entering a drum, and this is formed according to the patent of perforated metal or of wire gauze. There is no necessity of describing the structure at length, except to say that this patent shows it to have been known in the year 1841, that a perforated plate or wire 148 gauze could be used for arresting the sparks at the front end of a locomotive, and within the smoke-box. As I have before said, a perforated plate or wire gauze forms a better spark-arrester than do vertical spaces. The next patent to which I will refer is Exhibit H, being the patent of E. May, No. 17884 of the year 1857. This patent shows a spark-arrester in a locomotive

smoke-box. The two exhaust nozzles enter a drum made of perforated plates of metal or of wire gauze. At the upper end this drum is attached to a downward prolongation of the stack into the smoke-box, in this regard being like the defendant's structure; and, in fact, if the complainants' patent is to receive by the court such a broad interpretation as to take in the defendant's structure, then I fail to see why the same invention is not shown in the patent of May. In fact the patent of May shows a spark-arrester attached to a downward extension of the smoke-stack, with the exhaust nozzles entering a plate in the bottom of the spark-arrester, and practically if the complainants' patent is to be construed as covering the defendant's structure, then the defendant's patent would also embrace such a structure as is shown in the patent of May. In Defendant's Exhibit I, a spark-arrester is shown within the smoke-box of a locomotive, which spark-arrester is formed with horizontal slots like Defendant's Exhibit C. Exhibit I is a patent granted to J. L. Vauclain, No. 33114, in the year 1861. In this structure the area of the slots can be altered and the portion of the stack that projects downwards into the smoke-box can be adjusted in a vertical position. Above the horizontally slotted spark-arrester there is a wire netting. Defendant's Exhibit K is a patent granted to Weidman, Major, and Sample, No. 110,315 for the year 1870. This shows a spark-arrester, a petticoat pipe, and what the patent calls a draft pipe. The spark-arresting device is formed of finely perforated metal. Defendant's Exhibit L is a patent granted to A. S. Sweet, Jr., No. 38992 for the year 1863. In this device the exhaust nozzles enter a hollow cylinder made of wire gauze, which is secured at the bottom to the plate through which the exhaust nozzles pass. There is also another and upper screen which, by a deflector placed at its
149 base, is made efficient. This patent shows the use of wire gauze, and the screens are described as being in the form either of a cylinder or of the frustrum of a cone. Defendant's Exhibit M is the patent of J. Smith for a spark-arrester No. 106,515 for the year 1870. This patent shows the exhaust nozzles as entering a frustrum of a cone formed of perforated metal, which at the top united with a downward extension of the chimney. It is true that the perforations extend up to the smoke-arch. Outside of the perforated spark-arrester there is placed a sleeve or lift-pipe, as the patent calls it. This patent shows the use of a perforated spark-arrester attached to a downward portion of the chimney with a lift-pipe arranged outside of the perforated spark-arrester. The outer pipe or lift-pipe may be made adjustable.

Exhibit N is the patent of J. Smith, No. 112,506 for the year 1871. This patent shows a spark-arrester having in it a frustrum of a cone, either made of wire gauze or by a continuous bar of wrought iron coiled spirally, or of a number of cast-iron rings strung to thin rods, all these forms being illustrated in the patent. Around the arrester proper there is a lift-pipe, as in the exhibit last referred to. These various exhibits show different forms and kinds of material used to retain the larger and unconsumed parts of the fuel in the smoke-box. They show various forms and arrangements within the smoke-box to induce the draft by the blast, and, in my opinion, they limit the invention specified in the first claim of the complainants' reissue to a structure which is substantially the structure therein shown, to wit: a grating of vertical bars placed at the foot of the petticoat pipe, as shown and as I have before explained. The defendant's structure does not contain these parts or their arrangement, as described in the complainants' patent.

25 Q. In view of the prior patents referred to in your last answer and your practical experience with such structures, do you consider that the difference between complainants' vertical bars and the other forms of screen of prior date makes any material difference in the result accomplished so far as any advantage is concerned?

A. I do not think that there is any very material difference
150 between any of the forms, but I do think that the square
opening, or the horizontal slots, are better than slots of the kind used by the defendant, and I should think better than the openings described in the complainants' patent, as the forms that I have preferred are not so liable to stoppage by the entrance of the cinders.

26 Q. In view of the history of the application for letters patent by Kearney & Tronson, as shown by Defendant's Exhibits E and F, do you consider that the action of the applicants in striking out or cancelling their original statement of invention and claim, by which they apparently considered it immaterial how the screen was formed, that their said patent is necessarily limited to a device of the exact construction shown and described in their said patent?

A. I think it is.

27 Q. In your opinion, and under these circumstances, is there any invention in the patentable sense of the term disclosed in said reissued patent No. 5184, or is the difference between it and a prior patent referred to anything more than any skilled mechanic having knowledge of the art might make in the ordinary course of his business?

A. I do not think there is anything substantially new in that which is shown in the complainants' patent, in view of the state of the art.

Cross-examination:

28 X Q. Do you find described or shown on drawings in any previous patents a spark-arrester with vertical openings?

A. No.

29 X Q. Is there anything in the description or drawings of complainants' patent to exclude a cast grating made like Exhibit 5 for complainants?

A. No.

30 X Q. Are not the portions of iron in that casting, on each side of the vertical slots, bars of iron?

A. They are: and I say this with the following explanation, so that I may not be misconstrued. In the broad sense of the terms they are bars, but I do not think they are the bars that the patentees meant.

151 31 X Q. Do you think that from the description and the drawings a grate would be constructed like Defendant's Exhibit Kearney and Tronson's Spark-Arrester?

A. Substantially, the parts would not be soldered together, but would be attached so that they could resist the heat.

32 X Q. Do you find in the drawing that the dark line running horizontally about half way up the grate is any larger in diameter than the outside of the bars?

A. The length of the line is no greater than the diameter of the grate.

33 X Q. Please state how it is in the model.

A. It is not quite right in the model, it should be a ring passing inside of the bars holding the grate instead of outside as in the model; it makes no material difference to the structure whether the ring is inside or outside.

34 X Q. Do you know of any other grate being used by the defendant with vertical openings than Defendant's Exhibit Screen No. 1?

A. No; the ones I saw were all like Defendant's Exhibit Screen No. 1.

35 X Q. This screen has lugs projecting nearly half an inch outward at the end or part of the slots, has it not?

A. It has.

36 X Q. If a coal were sliding up one of these slots, as you have described, would not that projection make it more apt to remain in the slot than if there were no projection while the draft continued?

A. I do not see that it would.

37 X Q. It presents an obstacle to the upward current just on the outside of the grate, does it not?

A. Yes; but the current is flowing in through the slot with an upward tendency, and that would be the fact up to the top of the slot. When that was reached there would be no further upward tendency material until the bridge was passed and the next slot reached.

38 X Q. Then does not this lug tend to prevent the products of combustion entering at the lower end of the slot just above the lug?

152 A. The lug has a tendency to shorten the slot, substantially in the way suggested in the question.

39 X Q. In the photograph, Defendant's Exhibit B, are not the greater number of cinders lodged in a slot just above one of these lugs?

A. I should not say the greater number were lodged that way; in one case a cinder seems to be lying on one lug, in the other cases there seems to be spaces between the top of the lug and the cinder; in one or two cases there seem to be cinders close to the top of the lug in the bottom of the slot.

40 X Q. Did you ever see a grating like that now shown you, Complainants' Exhibit Defendant's Grating?

A. I may have; I do not remember whether all the engines that

I saw at Easton had lugs, neither do I think that there were lugs all round on the defendant's spark-arrester.

41 X Q. They cover the entire part shown in the picture, do they not?

A. They seem to in Exhibit B.

42 X Q. You have stated in describing the construction of the complainants' patent that the bars are fastened to the boiler plate at the bottom; will you look at the specification of complainants' patent and state whether or not the boiler plate is to provide a flat surface for the grate D to rest upon?

A. It is so described in the specification. When I used the word fastened, I did not mean to imply that they were screwed into or riveted to the boiler plate, but were in contact therewith.

43 X Q. Is the feature of a draft around the upper end of the petticoat pipe one claimed in the patent?

A. It is not claimed in the patent in the sense that there is a separate claim for it, but it is described in the patent, and the claim recognizes the fact that this is to be the structure in describing the pipe E as a petticoat pipe. No other form or device is shown or described but a petticoat pipe.

44 X Q. Is it not also called in the description and in the claim a spark pipe?

153 A. It is mentioned as a spark or petticoat pipe. It is a petticoat pipe.

45 X Q. Do you know whether or not at the time of the invention of Kearney and Tronson such a pipe as they called the petticoat pipe or spark pipe was in general use in locomotives?

A. I cannot say from my own knowledge, but I think petticoat pipes were used; how general that use was I cannot tell.

46 X Q. What is the evident purpose of a pipe extending below the smoke-arch?

A. The purpose of a pipe extending below the smoke-arch, as for example in defendant's structure, is to connect the spark-arrester with the chimney or stack, and make a channel up through which the exhaust steam can rush directly to the stack to make a draft through the tubes, in through the spark-arrester and up through the smoke-stack.

47 X Q. This is true, whether it be a petticoat pipe or an extension of the smoke-stack downwards below the smoke-arch?

A. It is only partly true, for in the petticoat pipe the rush of vapor upwards and out at the top of the petticoat pipe is used to create a second draft direct from the smoke-box around the petticoat pipe and into the stack; thus, when a petticoat pipe is used, all of the products of combustion do not necessarily pass through the spark-arrester at the lower portion of the petticoat pipe, and to create a powerful draft up the side of the petticoat pipe its top is reduced in area.

48 X Q. The upward force of the exhaust gives the products of combustion an upward tendency, even before they reach the spark-arrester in the smoke-arch, do they not?

A. Yes.

49 X Q. In the form of Defendant's Exhibit Screen No. 2 the products of combustion have to pass through the grating in a horizontal direction, do they not, or nearly so?

A. To an extent horizontally, and to an extent at an angle.

50 X Q. Does the force of gravitation make the heavy end of a body descend first?

A. That depends, I should think, to an extent.

154 51 X Q. Upon what?

A. Upon the relative size and shape of the heavy and light portions; for example, if you throw a stone out of the window with six inches of string tied to it, the stone will get to the sidewalk first. Now, if you take a ball and make half of it of lead and half of it of wood and throw it out of the window, I don't think it will make very much difference.

52 X Q. Suppose one ball were of lead and the other of wood, which would reach the sidewalk first?

A. Providing the question of air friction was eliminated, they would strike the sidewalk simultaneously. I have seen a feather and a lead ball fall side by side in a vacuum.

53 X Q. Then the difference in the heavier end going first is not due at all to gravitation, is it, but to resistance of the air, in a falling body?

A. I think it is largely due to the resistance of the air.

54 X Q. Is it not entirely so, since, in a vacuum, both bodies will fall the same distance in the same time?

A. I don't see that that follows as a sequence of the previous statement.

55 X Q. Do I understand you to say that an irregular cinder, having the same specific gravity in all parts, will, when forced by a blast of steam or air, go with the small end foremost?

A. I think it will; I think it will fly point first, very much as an arrow would fly.

56 X Q. Would an arrow made of a piece of wood smaller at one end, but of the same specific gravity, which started with the little end first, continue that way?

A. That would depend on the distance it had to travel and how it was caused to travel.

57 X Q. Of two coals being carried along by a blast, the specific gravity of one being twice as great as the other, which coal will be carried the fastest?

A. I think the light one will go the fastest.

58 X Q. Does not the description in the first patent granted Kearney and Tronson speak of the grate as having the peculiar features of perpendicular bars with fixed apertures?

155 A. Yes, sir.

59 X Q. And do not the drawings with the first patent indicate the same feature?

A. Yes.

60 X Q. Do you find that in the reissue any claim is made to what was disclaimed in the original patent?

A. No.

61 X Q. Is not the first claim in the reissued patent narrower than in the original patent in that the grating D is formed with vertical bars?

A. I think the claim of the reissue is narrower by reason of the introduction of the petticoat pipe as an element of the claim. The reissue speaks of vertical bars, and the original of longitudinal bars. I presume that means the same thing in the two instruments.

62 X Q. The drawings and the specifications in the first patent show a grating D connected with a pipe extending up into the smokestack?

A. Yes, the petticoat pipe in both cases extends up into the smokestack.

63 X Q. Do not both of the patents simply speak of the netting or grating which closes the aperture at the top of the pipe, as simply necessary if a petticoat pipe is used?

A. No. The two patents I think describe it as a part of the structure and do not suggest that it can be dispensed with.

64 X Q. Are the drawings, in both the original patent and the reissue, the same?

A. They are just alike with the exception of the plate A, which is shown in the reissue and not in the original.

65 X Q. What is the line in the original patent running horizontally at the foot of the grate?

A. I don't know; it is not described nor referred to.

66 X Q. In your opinion, would the operation of the grate be actually different whether a plate were there or not if the bottom of the grate around the nozzles were closed?

A. I don't think it would make any material difference. In the
original patent it is not described that the bottom of the grate
156 D is shut up; in the reissue the entire smoke-box is closed
around the bottom of the grate by the plate H. In the original there is a heavy line at the bottom of the grate that may have been intended to indicate a closing plate.

67 X Q. How long had the grating shown in Defendant's Exhibit B been used before you made the experiment?

A. I don't know.

68 X Q. Was it put in under your direction, or was the experiment made with one already in?

A. As I recall the matter it was already in.

69 X Q. How many trips did you make in each of these cases?

A. I should suppose about three; sometimes running from Easton to New York and back, and sometimes to Metuchen and sometimes to Bethlehem. I tried each grating, as I remember it, over the same number of miles of run.

70 X Q. With the same speed, the same length of train, and the same number of stops?

A. I should say so; it was the regular schedule train which ran alike every day.

71 X Q. Were these experiments made after the beginning of this suit for the purpose of the defence of this suit?

A. I presume so.

72 X Q. You made these experiments under the employment of the company, did you not?

A. I was in the employ of the Eastern Railroad Association, which I presume is defending this suit for the defendant.

73 X Q. Have any of the patents offered in evidence by the defendants, and which you have described, come into any general use?

A. I don't know. I believe the Smith device has.

74 X Q. His first or second patent?

A. I think both, but more the last; that is my impression.

75 X Q. With what form of grating?

A. I think with netting, but as to this I have not personal knowledge.

76 X Q. Is it not a common thing in an application for a patent for the applicant to describe a particular invention and then describe other modes of construction in order thereby to protect his patents?

157 A. It is a common thing to illustrate equivalent forms.

HENRY L. BREVOORT.

Attest: GEORGE W. WEIFFENBACH,
[NOTARIAL SEAL.] *Notary Public, N. Y. Co.*

UNITED STATES OF AMERICA,
Southern District of New York,
City, County, and State of New York, } *ss:*

I, George W. Weiffenbach, a notary public in and for the county of New York, and special examiner herein by consent, do hereby certify that the foregoing deposition of Henry L. Brevoort was taken before me at the times and at the place therein named; that the record hereto prefixed contains the whole of the said deposition, with the exception of the exhibits introduced as therein specified, which remain in possession of counsel by consent.

And I do further certify that I am not attorney, nor of counsel, for any of the parties in said cause, and am in nowise interested in the result of the suit.

In testimony whereof I have hereunto set my hand, at the city of New York, this 1st day of March, 1887.

[SEAL.] GEORGE W. WEIFFENBACH,
Notary Public (No. 146), New York County.

ANDREW REASONER, a witness for defendant, being duly sworn, deposes and says as follows:

1 Q. What is your name, age, residence, and occupation?

A. My name is Andrew Reasoner; age, 62 years; residence, Morristown, New Jersey; occupation, superintendent of the Delaware, Lackawanna and Western railroad, Morris and Essex division.

2 Q. How long have you been connected with the Morris and Essex railway?

A. Since March, 1869.

3 Q. Do you know of a spark-arresting device said to be invented by Francis Kearney and Luke F. Tronson having been used on said Morris and Essex railroad?

158 A. I was told there was a device used, and I saw it.

4 Q. Please look at the patent drawing now shown you and state if the device you saw in use was like that shown by said drawing.

A. This looks like it.

5 Q. Look at the model now shown you, Defendant's Exhibit Kearney and Tronson's Spark-arrester, and state if that substantially represents the device you saw in use?

A. I should think it did.

6 Q. State, if you please, what your experience was so far as the use of said spark-arrester is concerned, how long it was in use, and whether it is still in use, or, if not, why its use was discontinued.

A. Well, the locomotive did not work well, did not do its duty with that device in; it clogged up. Tronson, who was then our master mechanic, made some alteration, or undertook to make some alteration, so it would work better; it didn't help the matter any. We found that Tronson was more interested in patents than he was in our business, so we discontinued his labors and put another man in his place, Mr. Lewis. After Mr. Lewis took hold I called his attention to the engines having these devices on them. From what Mr. Lewis reported, I ordered the Kearney and Tronson devices removed. Since the removal they have never been used. I cannot tell how long they were used, probably five or six months.

Cross-examination waived.

ANDREW REASONER.

Attest: THOS. B. CLIFFORD,
[NOTARIAL SEAL.] *Notary Public, N. Y. Co.*

William H. Lewis, a witness for defendant, being duly sworn, deposes and says as follows:

—. What is your name, age, residence, and occupation?

A. My name is William H. Lewis; age, 59 years; residence, Hoboken, New Jersey; occupation, master mechanic of the
159 Morris and Essex division, Delaware, Lackawanna and Western railroad.

2 Q. How long have you been employed as master mechanic of said road?

A. Since December, 1871.

3 Q. Have you any knowledge with respect to the use of a spark-arresting device said to be invented by Francis Kearney and Luke F. Tronson, formerly employees of said road?

A. There were four engines equipped with it when I went on the road.

4 Q. Please look at Complainants' Exhibit I, reissued patent to Kearney and Tronson, No. 5184, and state if that represents sub-

stantially the device that was in use on these four engines when you took charge of the road as master mechanic.

A. That is similar except that, instead of the cone-shaped wire netting that connects the top of the petticoat pipe with the smoke-stack, the wire netting was straight or horizontal. It was a piece of square wire netting with a hole cut in it the size of the petticoat pipe.

5 Q. Look at model now shown you, the same being Defendant's Exhibit Kearney and Tronson Spark-arrester, and state whether the same represents substantially the device you had in use on these four locomotives; if there is any difference between the model and the devices so used, please state what that difference is.

A. The difference in that is these being round bars for the grating while the ones that we used were flat bars made of cast iron in sections. And what I explained before with regard to the netting connecting the top of the petticoat pipe with the smoke-arch.

6 Q. Are those devices still in use; if not, when did you discontinue their use and for what reason?

A. I discontinued their use in 1872; I could not tell the date; I have no records to show, on account of losing them by fire; the cause
of taking them out was because the engines did not make
160 steam enough, or steam sufficient to do the work required
of them. The grating clogged up with sparks and shut off
the draught.

7 Q. You have mentioned as part of the said Kearney and Tronson device a petticoat pipe; what do mechanics understand by the term petticoat pipe in the connection referred to?

A. By giving bottom and top draught, by having the top of the petticoat pipe smaller than the stack.

8 Q. Do I understand the term as applied to such devices when employed in the smoke-box of a locomotive engine?

A. Yes, that is the term that we give the petticoat pipe, because it is smaller at the top than the chimney, and wider at the bottom.

9 Q. Then, as I understand your answer to the last question, what is termed a petticoat pipe must have top draught as contradistinguished from an extension downward of the smoke-stack itself?

A. I understand that if the stack is extended downward it is merely an extension of the smoke-stack and not a petticoat pipe.

Cross-examined by Mr. HARRIS:

10 X Q. Is it necessary that either the smoke-stack be extended downward in the smoke-head, or that a petticoat pipe be used?

A. Not in all cases. We are doing away with that by simply extending the smoke-arch, and to form a receptacle for the sparks by so doing we do away entirely with the petticoat pipe by making long exhaust nozzles; in that case, the nozzles extend up to within eight or nine inches of the top of the smoke-arch.

11 X Q. For how long have they been used in that way?

A. I could not answer that question; we have never used them that way on the road.

12 X Q. Do you still use the petticoat pipe?

A. We do; yes.

13 X Q. If the nozzles do not extend nearly to the top of the smoke-arch, is it not necessary to use either a petticoat pipe or an extension of the smoke-stack downward?

161 Question objected to by counsel for defendant as immaterial and irrelevant.

A. It is.

14 X Q. Why?

A. To guide the steam into the smoke-stack so as to make a draught through the tubes.

15 X Q. Then, in other words, if it were not for some such pipe the force of the exhaust would be to destroy the draught?

A. It would; rather it would not induce any draught; in other words, the steam would expand within the smoke-box instead of being carried directly into the smoke-stack. The object is to produce a vacuum within the smoke-box and carry the product of combustion through the chimney.

16 X Q. Then an extension of the stack downward in the smoke-arch and a petticoat pipe are substantially for the same purpose?

A. Yes.

17 X Q. Upon what did the spark-arresters in the four locomotives you have mentioned rest?

A. On the bottom of the arch they rested. As I think further of the matter, my impression is that there was a ring fastened to the exhaust nozzles to make the grating fast to, but there was no plate like that shown in the model supporting the grating.

18 X Q. Please look at grating marked Complainants' Exhibit 5, and state whether the grating- used in the four engines were similar to a grating of which this is a section.

A. Yes, sir; that is a similar grating to what was used on the engines.

19 X Q. Were any of the gratings of wrought iron?

A. I don't remember whether there was any wrought iron or not; I only remember one like that.

20 X Q. Are you a locomotive engineer?

A. Yes; I have been.

21 X Q. Did you ever run one of the locomotives having the Kearney and Tronson arrester in it?

A. No, sir.

22 X Q. Is your information about its clogging up derived from the statements of others?

162 A. Yes; and what I saw myself; I had the door opened, and looked in when the engine came in.

23 X Q. What spark-arresters were used on the other locomotives when you became master mechanic?

A. There were common spark-arresters, with wire netting on the top of the stacks.

24 X Q. What is used now?

A. The same thing, only a little improved, but the extended smoke-arches are used quite a good deal among soft-coal-burning engines.

Redirect examination:

25 R. D. Q. Have you used the Kearney and Tronson device since the date of the reissue of the patent, Dec. 10, 1872?

A. No, sir.

26 R. D. Q. Did you ever use the device with a piece of boiler plate supporting the lower end of the grating, as shown by the model, Defendant's Exhibit Kearney and Tronson Spark-arrester?

A. I don't remember; I don't think there was a boiler plate similar to the model in the engines referred to.

27 R. D. Q. Did you ever use with said spark-arrester a downward extension of the smoke-stack?

A. No, sir.

28 R. D. Q. Then, when you said in your cross-examination that a downward extension of the smoke-stack was substantially the same as a petticoat pipe, did you speak generally or refer to the particular device used?

A. I said that the smoke-stack, when extended downward, was an extension of the smoke-stack, and not a petticoat pipe.

29 R. D. Q. Then do I understand you to say that a downward extension of the smoke-stack and a petticoat pipe are two different and distinct things?

A. Yes.

WM. H. LEWIS.

Attest: THOS. B. CLIFFORD,
[NOTARIAL SEAL.] *Notary Public, N. Y. Co.*

163 UNITED STATES OF AMERICA,
Southern District of New York,
City, County, and State of New York, } *ss:*

I, Thomas B. Clifford, a notary public in and for the county of New York, and special examiner herein by consent, do hereby certify that the foregoing depositions of Andrew Reasoner and William H. Lewis were taken before me at the time and place therein mentioned; that the record hereto prefixed contains the whole of the said deposition-.

And I do further certify that I am not attorney, nor of counsel, for any of the parties in said cause, and am in nowise interested in the result of the suit.

In testimony whereof, I have hereunto set my hand in the city of New York, the 1st day of March, 1887.

[SEAL.] THOS. B. CLIFFORD,
Notary Public, City and Co. N. Y.

164 EXHIBITS.

DEFENDANT'S EXHIBIT E.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the files of this office of the file-wrapper and contents in the matter of the letters patent granted Francis Kearney and Luke F. Tronson, April 11, 1871, number 113,528, for improvement in spark-arresters for locomotives.

In testimony whereof, I, E. M. Marble, Commissioner of Patents, have caused the seal of the Patent Office to be affixed this 13th day of April, in the year of our Lord one thousand eight hundred and eighty-three, and of the Independence of the United States the one hundred and seventh.

E. M. MARBLE,
Commissioner.

UNITED STATES PATENT OFFICE.

FRANCIS KEARNEY and LUKE F. TRONSON, of Newark, New Jersey.

Letters Patent No. 113,528, dated April 11, 1871.

Improvement in Spark-arresters for Locomotives.

The schedule referred to in these letters patent and making part of the same.

We, Francis Kearney and Luke F. Tronson, of the city of Newark, county of Essex and State of New Jersey, have made certain
165 improvements in spark-arresters in locomotives, of which the following is a specification:

The improvement relates to effectually preventing hot coals passing from the chimneys of locomotives, arresting them before they get to the chimney.

On the forward end of a locomotive boiler is an extension, on the top of which is the chimney or smoke-stack.

This receptacle of all that passes through the boiler flues to the smoke-stack is technically known as the smoke-head. The pipes from the boiler to the engines pass through the smoke-head, and the steam is exhausted thereinto from the cylinders.

In the unoccupied space in this smoke-head we place a grate, the peculiar features of which are its perpendicular bars with fixed apertures sufficiently fine to stop the sparks that come from the fire, the size of the grate being determined by the area of opening needed for the regular draught and escape of smoke on kindling the fire, or when the engine is not in motion.

Upon the top of the grating a tube or pipe is fitted, extending upward a short distance above the top of the smoke-head into the chimney. A space is left around the top of the pipe between the edges of the aperture in the top of the smoke-head and the pipe. This space is covered with netting or grating to prevent sparks or coals from passing through into the chimney.

In the accompanying drawing—

Figure 1 is a view in section of the front of the smoke-head with the gratings and pipe in position.

Figure 2 is a side view of the end of the boiler and of the smoke-head.

A is the boiler.

B, the flues.

C, the smoke-head.

D, the grate.

E, the pipe on the top of the grate.

F is the netting closing the aperture between the pipe and the smoke-head.

G is the chimney or smoke-stack; and

I, the exhaust pipes from the engines.

It will be seen that nothing but smoke and gas can pass the top netting F, and that no coals or dangerous sparks can pass into the chimney, they being arrested by the grate D without having received any impulse from the exhaust pipes.

The strong draught created by the exhausting steam up the pipe
into the chimney brings the coals and sparks to the grating,
166 against which they strike and fall harmless into the space in
the smoke-head.

By our arrangement the gases that are returned by contrivances that turn sparks downward in the smoke-stack, and sometimes force open the fire-door, have a clear passage to the atmosphere.

We disclaim all draught-rgulating contrivances, and also all gratings with lateral adjustable openings.

What we do claim as our improvement, and desire to secure, is—

The grate D with longitudinal bars, as and for the purposes specified and shown.

FRANCIS KEARNEY.
LUKE F. TRONSON.

Witnesses:
WM. M. GOODING.
EDWARD COLLVER.

To the Commissioner of Patents:

Your petitioners pray that a patent may be granted to them for the invention set forth in the annexed specification. And they hereby appoint Wm. M. Gooding, of the city of Newark, in the State of New Jersey, their attorney, with full powers of substitution and revocation to prosecute this application, and to make alterations and amendments therein, to receive the patent, and to transact all the business in the Patent Office connected herewith.

FRANCIS KEARNEY.
LUKE F. TRONSON.

Fifty cents. 50. W. M. G. Dec. 31, 1870. 50. Fifty cents.

Specification.

We, Francis Kearney and Luke F. Tronson, of the city of Newark, county of Essex, and State of New Jersey, have made certain improvements in spark-arresters in locomotives, of which the following is a specification.

Erase as per amendment filed Mar. 7, '71.

The improvement relates to effectually preventing hot coals passing from the chimneys of locomotives, [by a peculiar manner of] arresting them before they get to the chimney.

On the forward end of a locomotive boiler is an extension, on the top of which is the chimney or smoke-stack. This receptacle of all that passes from the fire through the boiler flues to the smoke-stack is technically known as the smoke-head; the pipes from the boiler to the engines pass through the smoke-head, and the steam
167 is exhausted thereinto from the cylinders. In the unoccupied space in this smoke-head we place a grate,

Erase and insert "A," filed Mar. 7, '71.

[formed either with bars or of netting, or perforated plates; the shape is not material; we make them circular, as being most convenient in ordinary cases. It is best there should be a clear space on all sides or around the grate.]

Upon the top of the grating a tube or pipe is fitted, extending upward a short distance above the top of the smoke-head into the chimney. A space is left around the top of the pipe, between the edges of the aperture in the top of the smoke-head and the pipe. This space is covered with netting or grating, to prevent sparks or coals from passing through into the chimney.

In the accompanying drawings, Fig. 1 is a view, in section, of the front of the smoke-head, with the gratings and pipe in position. Figure two is a side view of the end of the boiler and of the smoke-head. A is the boiler, B the flues, C the smoke-head, D the grate, E the pipe on the top of the grate, F is the netting closing the aperture between the pipe and the smoke-head, G is the chimney or smoke-stack, and I the exhaust pipes from the engines.

It will be seen that nothing but smoke and gas can pass the top netting F, and that no coals or dangerous sparks can pass into the chimney, they being arrested by the grate D, without having received any impulse from the exhaust pipes. The strong draft created by the exhausting steam up the pipe into the chimney brings the coals and sparks to the grating, against which they strike and fall harmless into the space in the smoke-head.

Erase as per amendment filed Mar. 13, 1871.

[The force of coals drawn from the fire when impelled by the exhaust steam up the chimney is such as to cut through netting, and even cast iron over a quarter of an inch thick, in two or three months, in any description of spark-arresters located in the smoke-stack.]

By our arrangement the gases that are returned by contrivances that turn sparks downward in the smoke-stack, and sometimes force open the fire-door, have a clear passage to the atmosphere.

What we claim and desire to secure is—

Erase and insert amendment "B," filed Mar. 7, '71.

[1. The grate D, pipe E, the net or grate F, as and for the purpose specified and shown.

2. Combining a spark-arrester with the smoke-head of a locomotive in the manner and for the purpose hereinabove set forth.]

FRANCIS KEARNEY.
LUKE F. TRONSON.

Attest:
WM. M. GOODING.
EDWARD COLLVER.

168 STATE OF NEW JERSEY, }
City of Newark, } *ss:*

Francis Kearney and Luke F. Tronson, being duly sworn, depose and say that they verily believe themselves to be the original, first and joint inventors of the within-described improved spark-arrester; that they do not know or believe the same was ever before known or used, and that they are citizens of the United States.

FRANCIS KEARNEY.
LUKE F. TRONSON.

Sworn to and subscribed before me this 31st day of December, 1870.

JOHN ROSE,
Justice of the Peace.

(No. 1.) 4th.

U. S. PATENT OFFICE,
WASHINGTON, D. C., *Feb.* 4, 1871.

Francis Kearney and Luke F. Tronson, care W. M. Gooding, Newark, N. J.:

Please find below a communication from the examiner in charge of your application for patent for spark-arrester for locomotive, filed Jan. 5th, 1871.

Very respectfully,

—— ——,
Commissioner.

Examiner's room No. 19.

In the matter of the application above referred to, the alleged invention is substantially anticipated in patent to James L. Vauclain, bearing date August 20, 1861 (div. spark-arresters). A patent is therefore refused.

E. QUINN, *Examiner.*

To the Commissioner of Patents.

SIR: In the matter of the application of Messrs. F. Kearney and Luke Tronson, for a patent for an improved spark-arrester in locomotives, filed Jan. 5, 1871, refused Feb. 4, the references have been considered, and are found to be in a measure anticipatory of our invention, as set forth and claimed. Nevertheless, as the Vauclain is an ingenious contrivance, and the parts would operate where there was no gases, no dirt, no fluxious or easily fusible materials to clog
it, in so far as a regulator of draft is concerned, and as it
169 never could be an efficient spark-arrester, for when sufficiently
open to admit of sufficient draft there would be no impediment to the coals that the strong draft would bring from the fire, for which reasons, in the ten years' existence of the patent, it has found no favor among the master mechanics or engineers on our railroads, and the necessity is as great as ever, as in spite of the numerous applications inside chimneys or smoke-stacks, the wear and tear is so great that the protection is so temporary, our roads are continually having to pay damages for the burning of property, burned by sparks from their locomotives. Mr. Tronson, being head master mechanic on the Morris and Essex Railroad of New Jersey, has in use a grate that obviates all the hitherto unsurmounted difficulties, and is therefore an actual practical improvement upon the others; we, therefore, submit the following amendments in our specifications and claim, respectfully requesting a re-examination on the new exclusive feature in the improvement.

Amendments.

We would erase from the paragraph stating the relation of the improvement the words "a peculiar manner of," which would make it read thus:

The improvement relates to effectually preventing hot coals passing from the chimneys of locomotives, by arresting them before they get to the chimney.

From the paragraph beginning with the words, "in the
"A." uncovered space in the smoke-head, we place a suitable
grate," we erase what follows the word, grate (that ends our quotation), descriptive of the grate, and insert the following words, "the peculiar features of which are its perpendicular bars with fixed apertures sufficiently fine to stop the sparks that come from the fire, the size of the grate being determined by the area of opening needed for the regular draft and escape of smoke in kindling the fire, or when the engine is not in motion." This being immediately followed by the words, upon the top of the grating, &c. We would erase the claim, and insert the following disclaimer and claim.

We disclaim all draft-regulating contrivances, and also
"B." all gratings with lateral adjustable openings. What we
do claim as our improvement and desire to secure is the

grate D, with longitudinal bars as and for the purpose specified and shown.

FRANCIS KEARNEY AND
LUKE TRONSON,
Per attorney, W. M. GOODING.

Newark, N. J., March 6, 1871.

170 (No. 1.)

U. S. PATENT OFFICE,
WASHINGTON, D. C., *March* 8, 1871.

Francis Kearney and Luke F. Tronson, care W. M. Gooding, Newark, N. J.:

Please find below a communication from the examiner in charge of your application for patent for spark-arrester for locomotives, filed Jan. 5, 1871.

Very respectfully,
—— ——,
Commissioner.

Examiner's room No. 19.

The amendment has been considered, and as far as it goes is accepted, but further amendments appear to be necessary. The following is suggested, and when complied with the case may pass for issue. Erase on page three, line 19, beginning with the word "the" and ending with the word "stack," on line 25, same page.

195. E. QUINN, *Examiner.*

To the Commissioner of Patents.

SIR: In the case of the application of Messrs. Kearney and Tronson for a patent for a spark-arrester for locomotives, which was filed Jan. 5, 1871, and in which application certain amendments have subsequently been made, in compliance with the kind suggestions made in yours of the 8th of March, the following additional amendment is submitted:

We would erase on page 3, line 19, beginning with the word "the" and ending with the word "stack," on line 25 same page.

Respectfully,
FRANCIS KEARNEY AND
LUKE TRONSON,
Per attorney, W. M. GOODING.

Newark, N. J., March 11, 1871.

To the Commissioner of Patents.

171 SIR: Enclosed please find P. O. order for final fee, in the case of Messrs. Kearney and Tronson, for a spark-arrester, allowed March 16, 1871.

Respectfully,
W. M. GOODING, *Attorney.*

Newark, N. J., March 23, 1871.

U. S. Patent Office.

Application of Kearney & Tronson filed Jan'y 5, 1871.

Contents of this File.

1. Application.
2. Rej. Feb. 4, '71.
3. Amend't filed March 7, '71.
4. Letter to app't March 8, '71.
5. Amend't March 13, '71.

1871. 162
13.

No. 113,528.
Francis Kearney and Luke F. Tronson,
Of Newark,
County of Essex,
State of New Jersey.
Spark-arresters for locomotives.

Rec'd	Jan'y 5, 1871.	
Petition,	" " "	
Affidavit,	" 16, "	
Specification,	" 5, "	
1 drawing,	" 18, "	
Model,	" 7, "	

Cert. dep., —.
1 cash, $15, Jan'y 5, 1871.
Add'l fee cert., —.
1 add'l fee cash $20, March 25, 1871.
Examined March 14, 1871. E. Quinn.
2. Issue, Grinnell, March 14, 1871.
33. Patented April 11, 1871.
33. Recorded vol. —, page —.
Circular, March 16, 1871.
W. M. Goooding, Newark, N. J.
Rej. Feb. 4, 1871.
Ex'd, J. A. W., March 8, 1871. Letter M. McK.
Reissued Dec. 10, 1872. No. 5184.

172

Defendant's Exhibit F.

Department of the Interior,
United States Patent Office.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the files of this office of the file-wrapper and contents in the matter of the reissue letters patent granted Francis Kearney and Luke F. Tronson, December 10, 1872, number 5184, for improvement in spark-arresters for locomotives.

In testimony whereof I, E. M. Marble, Commissioner of Patents, have caused the seal of the Patent Office to be affixed this thirteenth day of April, in the year of our Lord one thousand eight hundred and eighty-three, and of the Independence of the United States the one hundred and seventh.

[L. S.] E. M. MARBLE,
Commissioner.

UNITED STATES PATENT OFFICE.

FRANCIS KEARNEY and LUKE F. TRONSON, of Newark, New Jersey.

Improvement in Spark-arresters for Locomotives.

Specification forming part of Letters Patent No. 113,528, dated April 11, 1871; Reissue No. 5184, dated December 10, 1872.

To all whom it may concern:

Be it known that we, Francis Kearney and Luke F. Tronson, both of the city of Newark, county of Essex and State of New Jersey, have invented certain new and useful improvements in spark-arresters for locomotives; and hereby declare the following to be a full and clear description of the same, reference being had to the accompanying drawing, in which—

Figure 1 is a vertical cross-section of the smoke-box of a loco-
motive with our improvements attached, and Fig. 2 is a
173 vertical longitudinal section of the same, and a portion of
the boiler.

The letters of reference indicate the same parts in both figures.

A represents a portion of the boiler of a locomotive. B is a space, commonly called the smoke-box. C C are the flues at the point where they enter the smoke-box; E is a pipe extending from within the base of the smoke-stack down into the smoke-box, and commonly termed a "petticoat pipe." D is a grating placed at the lower part of the petticoat pipe to prevent any cinders or sparks passing into the same. F is a netting or grating placed around the top of the petticoat pipe so as to cover the annular opening caused by the difference in size of the upper part of the petticoat pipe and the bottom of the smoke-stack G. H is a piece of boiler plate or sheet iron placed at the bottom of the smoke-box in order to provide a flat surface for the grate D to rest upon, and is provided with holes, through which the exhaust pipes I I pass.

Our improvements relate to providing locomotives with a suitable device for preventing live coals, cinders, sparks, and like substances, which may leave the furnace, from passing into or out of the smoke-stack, and to retain them in the smoke-box, from which place they may be removed at pleasure.

It has heretofore been the practice to cover the tops of smoke-stacks of locomotives with a wire netting or grating for the purpose of preventing the escape of sparks and cinders; and, in some cases, an inverted metal cone is also placed in the centre of such netting or grating to receive and break the force of the cinders as they are thrown against it. In all of these contrivances the cinders receive so much force from the exhausting steam while on their way up the petticoat pipe and smoke-stack that they very soon destroy the netting or grating placed at the top of the smoke-stack, and, where a cone or other device is used to turn the cinders downward and partially protect the grating the gases are also retarded in their escape.

In order to overcome these difficulties, we place a grating, F (D), at or near the lower end of the petticoat pipe E so as to surround the exhaust pipes I I and prevent any cinders or sparks entering the pipe E, while allowing free passage for the smoke and gases. We also place a grating or netting, F, around the top of the petticoat pipe to cover the aperture left between it and the smoke-stack in order to arrest any sparks or cinders that may be drawn to that point.

174 We construct the grating D with straight vertical bars of iron, placed at small distances apart, but these spaces should be such, in the aggregate, as will be sufficient for the draft and escape of the smoke, on kindling the fire, or when the engine is not in motion.

By this arrangement nothing but smoke and gas are allowed to pass the netting F, and no coals or dangerous sparks can pass out of the smoke-box into the petticoat pipe, they being arrested by the grating F before having received any very great impulse by reason of the exhaust pipes. The strong draft up the pipe E and smoke-stack brings the greatest portion of the cinders and sparks to the grating D, against which they strike and fall harmless to the bottom of the smoke-box, while the smoke and gases have free and uninterrupted egress through the petticoat pipe and smoke-stack, they being perfectly clear; and the gratings D and F are not liable to be injured by the cinders striking against them, as they are arrested before having obtained the force they would have if allowed to pass up into the smoke-stack.

What we claim as our invention, and desire to secure by letters patent, is—

1. The grating D with vertical bars placed at the foot of the spark or petticoat pipe E, in the manner and for the purpose substantially as described.

2. The combination of the grating D with the netting F, in the manner and for the purpose substantially as described.

FRANCIS KEARNEY.
LUKE F. TRONSON.

Witnesses:
MUNSON G. DOREMUS.
A. B. MALCOMSON, Jr.

Corrections in Reissue Letters Patent No. 5184.

It is hereby certified that in reissued letters patent No. 5184, granted December 10, 1872, to Francis Kearney and Luke F. Tronson, for an improvement in "spark-arresters for locomotives," the reference letter in lines 62 and 82 of the printed specification was inadvertently printed "F" instead of "D;" and that the specification should be read with this correction to make the same conform with the files and records of the case in the Patent Office.

175 Signed, countersigned, and sealed this 20th day of March, A. D. 1883.

[SEAL.] M. L. JOSLYN,
Acting Secretary of the Interior.

Countersigned:
E. M. MARBLE,
Commissioner of Patents.

We hereby make and appoint A. B. Malcomson, Jr., of the city of New York, our attorney to in all respects represent and act for us in relation to our application for a reissue of letters patent granted to us April 11, 1871, for improvement in spark-arresters for locomotives, and to sign the drawings therefor, also to make any amendment in any petition, specification, or other document or paper connected with the above matter, and to receive the patent when granted; with authority to appoint a substitute or substitutes under him, hereby ratifying and confirming all that our said attorneys or said substitute or substitutes may lawfully do or cause to be done in the premises.

Dated May 9, 1872.

FRANCIS KEARNEY.
LUKE F. TRONSON.

(50. May 9, '72. 50.)

I hereby substitute and appoint Cochrane & Malcomson, of the city of New York, attorneys in the above-entitled matter.

A. B. MALCOMSON, Jr.

To the Honorable M. D. Leggett, Commissioner of Patents:

Your petitioners, of Newark, New Jersey, pray that they may be allowed to surrender the letters patent for an improvement in spark-arresters for locomotives granted to them April 11, 1871, whereof they are now sole owners, and that letters patent may be reissued to them for the same invention upon the annexed amended specification. Accompanying this petition is an abstract of title, duly certified, as required in such cases.

FRANCIS KEARNEY.
LUKE F. TRONSON.

176 To all whom it may concern:

Be it known that we, Francis Kearney and Luke F. Tronson, both of the city of Newark, county of Essex, and State of New Jersey, have invented certain new and useful improvements in spark-arresters for locomotives, and hereby declare the following to be a full and clear description of the same, reference being had to the accompanying drawing in which:

Figure 1 is a vertical cross-section of the smoke-box of a locomotive with our improvements attached, and

Figure 2 is a vertical longitudinal section of the same, and a portion of the boiler.

The letters of reference indicate the same parts in both figures.

A represents a portion of the boiler of a locomotive; B is a space commonly called the smoke-box; C C are the flues at the point where they enter the smoke-box; E is a pipe extending from within the base of the smoke-stack down into the smoke-box and commonly termed a "petticoat pipe;" D is a grating placed at the lower part of the petticoat pipe to prevent any cinders or sparks passing into the same; F is a netting or grating placed around the top of the petticoat pipe so as to cover the annular opening caused by the difference in size of the upper part of the petticoat pipe and the bottom of the smoke-stack G; H is a piece of boiler plate or sheet iron placed at the bottom of the smoke-box in order to provide a flat surface for the grate D to rest upon, and is provided with holes through which the exhaust pipes I I pass.

Our improvements relate to providing locomotives with a suitable device for preventing live coals, cinders, sparks, and like substances, which may leave the furnace, from passing into or out of the smoke-stack, and to retain them in the smoke-box, from which place they may be removed at pleasure.

It has heretofore been the practice to cover the tops of smoke-stacks of locomotives with a wire netting or grating, for the purpose of preventing the escape of sparks and cinders, and in some cases an inverted metal cone is also placed in the centre of such netting or grating to receive and break the force of the cinders as they are thrown against it.

In all of these contrivances the cinders receive so much force from the exhausting steam whilst on their way up the petticoat pipe and smoke-stack that they very soon destroy the netting or grating placed at the top of the smoke-stack, and, where a cone or
177 other device is used to turn the cinders downwards and partially protect the grating, the gases are also retarded in their escape.

In order to overcome these difficulties, we place a grating D at or near the lower end of the petticoat pipe E so as to surround the exhaust pipes I I, and prevent any cinders or sparks entering the pipe E while allowing free passage for the smoke and gases; we also place a grating or netting F around the top of the petticoat pipe to cover the aperture left between it and the smoke-stack in order to arrest any sparks or cinders that may be drawn to that point.

[In the construction of the grating E we prefer to use vertical bars as shown in the drawing, but any style or kind of grating may be used that will prevent cinders or sparks from entering the petticoat pipe, such as a perforated surface or a grating formed in any manner desired, and the apertures or perforations may be regulated in size and area of surface covered by the amount of opening required for the regular draught and escape of smoke on kindling the fire or when the engine is not in motion.]

Erase and insert "A," filed Sept. 20, '72.

By this arrangement nothing but smoke and gas is allowed to pass the netting F, and no coals or dangerous sparks can pass out of the smoke-box into the petticoat pipe, they being arrested by the grating D before having received any very great impulse by reason of the exhaust pipes. The strong draught up the pipe E and smoke-stack brings the greatest portion of the cinders and sparks to the grating D, against which they strike and fall harmless to the bottom of the smoke-box, whilst the smoke and gases have free and uninterrupted egress through the petticoat pipe and smoke-stack, they being perfectly clear; and the gratings D and F are not liable to be injured by the cinders striking against them, as they are arrested before having obtained the force they would have if allowed to pass up into the smoke-stack.

What we claim as our invention and desire to secure by letters patent is—

Erase and insert "A" amendment, filed Sept. 19, '72.

[First. Placing a grating in the smoke-box of a locomotive to prevent sparks or cinders entering the petticoat pipe, substantially as described and shown.

Second. The combination of the grating D with the netting F, substantially as and for the purposes described and shown.]

FRANCIS KEARNEY.
LUKE F. TRONSON.

Witnesses:
MUNSON G. DOREMUS.
A. B. MALCOMSON, Jr.

178 State of New Jersey, } ss:
County of Essex, }

Francis Kearney and Luke F. Tronson, the above-named petitioners, being duly sworn, depose and say that they verily believe that by reason of an insufficient or defective specification their aforesaid letters patent are inoperative or invalid; that the same error has arisen from inadvertence, accident, or mistake, and without any fraudulent or deceptive intention to the best of their knowledge and belief; that they are the sole owners of said letters patent; and that they verily believe themselves to be the first and original inventors of the improvements set forth and claimed in this amended specification.

FRANCIS KEARNEY.
LUKE F. TRONSON.

Sworn to and subscribed before me this 9th day of May, 1872.

[L. S.] MUNSON G. DOREMUS,
Notary Public.

The United States Patent Office.

To all persons to whom these presents shall come, Greeting:

This is to certify that careful search has been made of the digest of this office, and no assignment, agreement, license, power of attorney, or other instrument of writing is found of record under or relating to letters patent granted to Francis Kearney and Luke F. Tronson, No. 113,528, dated April 11, 1871, for "spark-arrester for locomotives."

In testimony whereof I, M. D. Leggett, Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this third day of June, in the year of our Lord one thousand eight hundred and seventy-two, and of the Independence of the United States the ninety-sixth.

[L. S.] M. D. LEGGETT,
Commissioner.

UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., *June* 10, 1872.

Francis Kearney and Luke F. Tronson, care Cochrane and Malcomson, New York, New York:

179 Please find below a communication from the examiner in charge of your application for patent for spark-arrester for locomotives.

Reissue filed June 7, 1872.

Very respectfully,

—— ——,
Commissioner.

Examiner's room No. 19.

The application above referred to is rejected on reference to James L. Vauclain, smoke-stack, Aug. 20, 1861, Weidman, Major, and Sample, spark-arresters, Dec. 20, 1870, and James Smith, spark-arresters, March 7, 1871.

T. C. BRECHT,
1st Ass't Ex'm'r in Charge.

To the Commissioner of Patents.

SIR: We hereby amend our specification of improved spark-arrester, filed by us for a reissue of the patent granted to us April 11, 1871, by striking out the claims appended thereto, and inserting in lieu thereof the following:

First. The grating D, with vertical bars placed at the foot of the spark or petticoat pipe E, in the manner and for the purpose substantially as described. "A."

Second. The combination of the grating D with the netting F, in the manner and for the purpose substantially as described.

Respectfully submitted.

FRANCIS KEARNEY,
LUKE F. TRONSON,
Per COCHRANE & MALCOMSON,
Their Attorneys.

To the Commissioner of Patents.

SIR: We hereby amend our specification of improved spark-arrester, filed by us for a reissue of the patent granted to us April 11, 1871, by striking out from the commencement of the second line from bottom of page 4 to the end of the eighteenth line on page 5, and inserting in lieu thereof the following:

"A." "We construct the grating D with straight vertical bars of iron, placed at small distances apart, but these spaces should be such, in the aggregate, as will be sufficient for 180 the draft and escape of the smoke on kindling the fire, or when the engine is not in motion."

Respectfully submitted.

FRANCIS KEARNEY,
LUKE F. TRONSON,
Per COCHRANE & MALCOMSON,
Their Attorneys.

NEW YORK, *July* 29, 1873.

SIR: In the letters patent No. 5184, reissued Dec. 10, 1872, there appears to be two errors in the letters of description.

First. On second page of the printed copy of specifications, seventh line, in order to overcome these difficulties we place a grating F (the letter should be D) at or near the lower end of petticoat pipe E.

Second. Same page, twenty-seventh line, being arrested by the grating F (this should be letter D).

Will you please have the specifications compared with the original and inform me whether the error was the attorneys' or the office, and advise me as to the best course to pursue to have the same corrected.

I herewith enclose the letters patent, which please return.

Very respectfully, J. H. IMMEN,
Box 1311, *N. Y. P. O.*

Hon. J. M. Thacher, acting Commissioner of Patents, Washington, D. C.

Reissue.

U. S. Patent Office.

Application of Kearney & Tronson filed June 7, '72.

Contents of this File.

1. Application.
2. Rej. June 10, '72.
3. Amend't Sept. 19, '72.

1872. No. $^{196}_{14}$.

No. 5184.

Reissue.

181 Francis Kearney and Luke F. Tronson,
Of Newark,

County of Essex,
State of New Jersey.
Spark-arresters for locomotives.
Rec'd June 7, 1872.
Petition, “ “ “
Affidavit, “ “ “
Specification, “ “ “
1 drawing, “ “ “
Old patent, No. 113,528, April 11, '71.
Cer. dep., —.
1 cash, $30, June 7, 1872.
Examined, T. C. Brecht, Sept. 20, “
2. Issue, Knight, Dec. 5, “
4. Patented April 11, 1871.
Certificate of correction issued March 20, 1883.
Reissued Dec. 10, 1872.
Recorded ——.
Cochrane & Malcomson, New York, N. Y.

1872.

Rej. June 10, 1872.

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DEFENDANT'S EXHIBIT G.

UNITED STATES PATENT OFFICE.

WILLIAM W. HUBBELL, of Moyamensing, Pennsylvania.

Spark Depositor.

Specification forming part of Letters Patent No. 2143, dated June 26, 1841.

To all whom it may concern:

Be it known that I, William W. Hubbell, of the township of Moyamensing, in the county of Philadelphia and State of Pennsylvania, have invented an improvement in the manner of constructing a spark depositor, or apparatus for preventing the escape of sparks and dust from the chimneys of locomotives, and other steam engines, and I do hereby declare that the following is a full and exact description thereof.

(Here follows diagram marked p. 182.)

In the accompanying drawing, A A represents a portion of the smoke-box, which is surmounted by a drum B B, and upon this is placed the chimney C C, which is hinged at *a* to the top of said drum, to admit of its being turned over when passing under bridges. Within the drum B B, is contained the principal part of the apparatus by which the sparks are to be arrested and deposited. D D is a cylinder of perforated metal, or wire gauze, which is closed at its lower end by a plate of metal E E. The part D′ which is represented as projecting below the plate E E, is shown as so placed to receive the ends of the exhaust steam-pipes *b b*, which may be made shorter than they must be without the use of this device; this, however, is not essential, and it is to be considered merely a prolongation of D D, and may be altogether omitted; the cylinder D D is left open at its upper end. Within B B there is another belt, or zone, of perforated metal, or wire gauze, F F, which is united to it at *c c*, and extends up conically from it to an annular plate of metal *d d*, by which F and D are united, and the space between them is enclosed. G G is an unperforated casing, or tube, of metal which is partly within, and partly below, the drum B B. The part below is shown at G G, Fig. 2, which is a view of the exterior of a part of the drum. The upper end of G G is as shown in the drawing, at some distance from the plate *d d*, as a part of the draft is to pass over this edge. The lower edge of the drum B B is united to the unperforated case G G, by an annular plate of metal which forms an inclined plane, in order to cause the sparks that fall within the space between them to descend into a box or receptacle prepared to receive them, and which is shown in section at H.

The course of this inclined annular plate is shown by the line

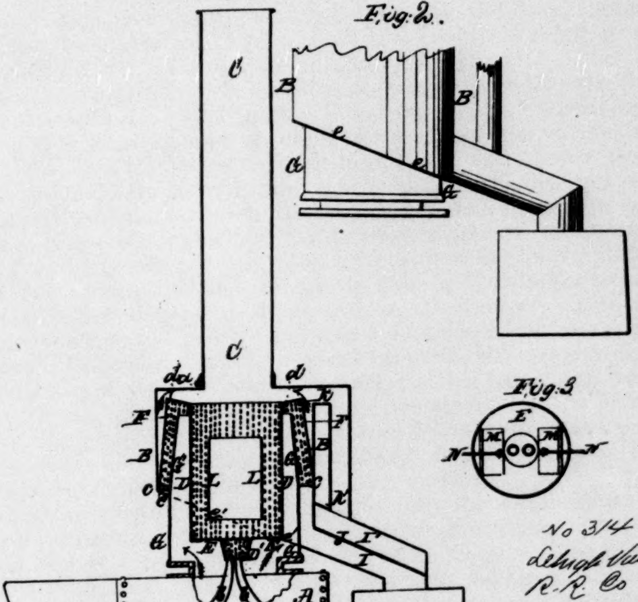
1821

W. W. Hubbell,

Spark Arrester,

No. 2,143. Patented June 26. 1841

Fig: 1 Fig: 2. Fig: 3



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Lehigh Valley
R. R. Co
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p 182

e e, Fig. 2, and by the line *e*, and the dotted line *e′ e′*, Fig. 1. I I′ is a tube, or pipe, leading from the drum B B, at the lower edge of the inclined plate, into the receptacle H; this pipe is divided into two parts by a perforated diaphragm J, which extends from one side of it to the other; through the lowermost of these divisions, I, the sparks pass into the receptacle H, and the perforated diaphragm J allows the steam and heated air by which they are urged forward to escape into the upper space I′, and thence through a tube K K, into the upper part of the drum B B, and thence into the chimney. L L is a tube open at both ends, and supported by stays in the middle of D D; its intention is to aid in directing the exhaust steam upwards into the chimney and thus to prevent it from interfering, by its expansion, with the passage of the draught through the perforated metal.

Operation.—The draught from the fire passes up into the space between the imperforated casing G, and the perforated casing D, through the perforations of which a large portion of it passes and enters the chimney. The sparks with the remaining portion of the draught pass over the upper edge of G, into the space between it and the perforated metal plate F F, and the sparks fall, or rather are forced down, on to the inclined annular piece of metal which forms the bottom of this space, and is represented by the line *e e*, the larger portion of that part of the draught which passes over the top of G G finds its way through the perforations in the belt, or zone F F, into the space between it and B B, and thence over the plate *d d* and into the chimney. A portion of the draught will accompany the sparks down the inclined plate *e e*, and through the pipe I, into the receptacle H; and this portion will escape into the chimney by passing through the perforations in the diaphragm J, into the space I′, thence through the tube K K into the chimney; by this last arrangement, the portion of the draught which accompanies the sparks forcibly carries and deposits them in the box H, instead of allowing them to descend by their own gravity alone, as is generally the case in spark arresters; in this particular, its operation is more efficient than any other instrument for the same purpose. By attaching the chimney to the drum by means of a hinged joint, it can be lowered when necessary, so as to enable it to pass under the lowest bridges known on our railroads.

In order to allow a direct draught into the chimney when the engine is not in action, I place valves, or shutters, on the bottom plate E E of the perforated cylinder D D; these may be hinged, or be made to slide, as may be preferred, there being rods to open or close them passing from them, and through the outer case of the apparatus.

Fig. 3 shows the under side of the cylinder D D, and M M are two shutters, or valves, which may be opened or closed by means of the rods N N.

Having thus fully described the improvements in the spark depositor invented by me, what I claim therein as new and desire to secure by letters-patent is the particular manner in which I have combined and arranged the respective parts thereof, as herein set forth, that is to say, I claim in combination the perforated cylinder D D, and the perforated belt or zone F F, connected with each other by means of imperforated annular plate *d d*, the lower edge of F F being connected to the drum B B, as described and represented.

I also claim in combination with each other, the so arranging of the inclined annular plate of metal *e e*, the tube I I′, the perforated diaphragm J, and the tube K, as to conduct and deposit the sparks in the receptacle H, whilst that portion of the draught which accompanied them and forced them down is allowed to escape into the chimney, in the manner set forth.

WM. W. HUBBELL.

Witnesses:

THOS. P. JONES.
JOHN C. JOHNSTON.

E. May. 184

Spark Arrester.

No 17,884. Patented July 28, 1857.

Fig. 2

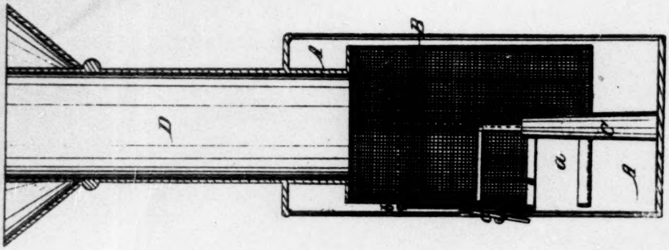
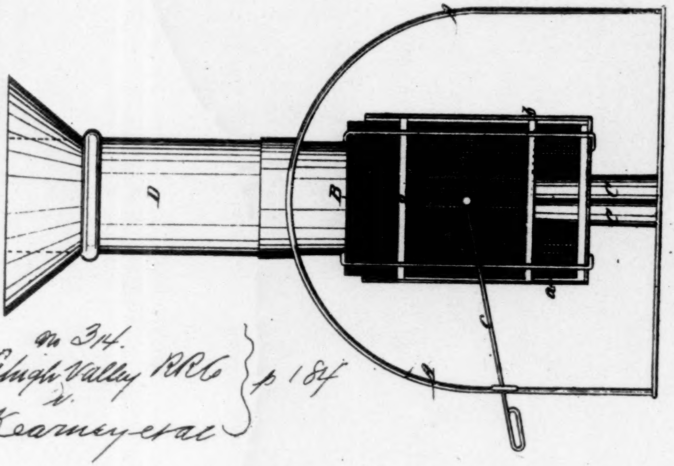


Fig. 1



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185 DEFENDANT'S EXHIBIT H.

UNITED STATES PATENT OFFICE.

ETHELRED MAY, of Boston, Massachusetts.

Spark Arrester.

Specification forming part of Letters Patent No. 17884, dated July 28, 1857.

To all persons to whom these presents shall come:

Be it known that I, Ethelred May, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful improvement in the arrangement of a spark arrester in a locomotive steam engine: and I do hereby declare that the same is fully described and represented in the following specification and the accompanying drawings, of which—

(Here follows diagram marked p. 184.)

Figure 1 exhibits a view of the smoke-box and chimney of a locomotive steam engine provided with my invention.

Figure 2 is a sectional view of the same taken longitudinally of the engine.

The nature of my improvement consists in prolonging the spark arrester from the chimney or stack down within and near the bottom of the smoke-box, and making the prolongation of wire gauze or perforated plates of metal, and closed at bottom so that the entire track of the smoke shall be through the perforated plates or wire gauze spark arrester as arranged in the smoke-box.

In the drawings, A exhibits the smoke-box; B the spark arrester; C C, the steam blast-pipes, and D the chimney. This spark arrester, as shown in the drawings, is represented as a cylindrical cage or sieve, made either of woven wire or perforated sheet-metal—it being formed with meshes when it is constructed of woven wire. These meshes or perforations should be in great number and of a very small size, in order to arrest the sparks and cinders, and allow the escape of smoke through the said meshes. The steam blast-pipes lead up into the lower part of the spark arrester, while the chimney is led out of its upper part. For the purpose of gaining access to the interior of the spark arrester I usually construct it with an opening, *a*, in its front, and with a sliding door *b*, so adapted to the said opening as to be capable of either covering or uncovering the same as circumstances may require. This door may be jointed to a hand-lever *c*, extending through the side of the smoke-box, and applied thereto in such manner as to enable a person to operate the door.

The advantages of making the spark arrester within the smoke-box instead of placing it within the chimney or in a chamber arranged above the smoke-box, and made to communicate therewith by a flue, are, that the spark arrester is rendered easier of access when it may be desirable to cleanse it. It causes the sparks and cinders to gather and remain in the smoke-box, from which they can be easily removed. It also enables a larger straining surface to be exposed to the smoke, and it is placed to better advantage for the impingement of smoke against it as well as for the introduction and operation of the blast-pipes.

I do not claim combining with a chimney of a railway locomotive steam boiler woven netting to prevent the escape of sparks and cinders therefrom ; nor do I claim arranging a perforated or woven-wire cone in a chamber placed over a smoke-box of a locomotive engine-boiler and *and* made to communicate with such a flue surrounding and being concentric with such chamber, the same being shown in the patent of R. A. Wilder, dated October 31, 1854.

Nor do I claim surrounding the exhaust pipes with two cylinders, perforated or not, and having the outer one connected with rings with the sides of the smoke-arch as described in J. Williams' patent of March 6th, 1855 ; nor do I claim prolonging an unperforated tubular smoke-stack down to near the bottom of the smoke-box, and providing it (the said stack) with one large opening for the reception of the smoke and products of combustion ; but what I do claim is my arrangement of the spark arrester within the smoke-box of the locomotive steam-boiler so that the stack or chimney shall be prolonged down into the smoke-box and made of wire gauze or perforated plates, and otherwise so constructed as specified that the entire track of the smoke shall be through the gauze or perforated plates.

In testimony whereof I have hereunto set my signature this 25th day of May, A. D. 1857.

ETHELRED MAY.

Witnesses:
R. H. EDDY.
F. P. HALE, Jr.

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J. L. Vauclain,

Spark Arrester,

No. 33,114. Patented Aug. 20, 1861.

Fig. 1.

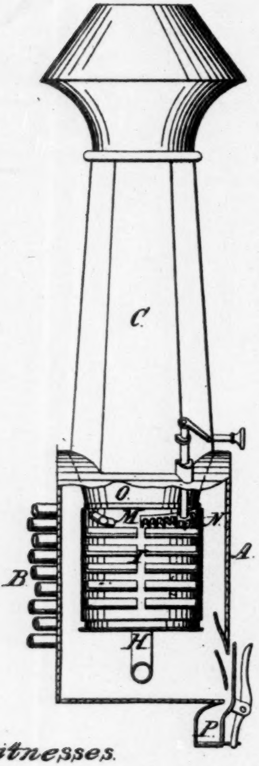
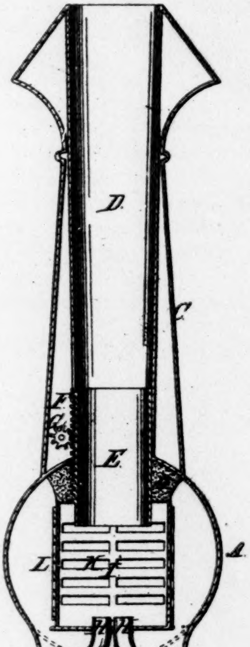


Fig. 2.



Witnesses.

Francis Millward
Jno T Fletcher

Inventor.

James L. Vauclain
per Knight & Bradley

187 DEFENDANT'S EXHIBIT I.

UNITED STATES PATENT OFFICE.

JAMES L. VAUCLAIN, of Lafayette, Indiana.

Locomotive Smoke-stack.

Specification forming part of Letters Patent No. 33114, dated Aug. 20, 1861.

To all whom it may concern:

Be it known that I, James L. Vauclain, of Lafayette, Tippecanoe Co., State of Indiana, have invented a new and useful improvement in locomotive smoke-stacks, and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings making part of this specification:

(Here follows diagram marked p. 186.)

My invention relates to an arrangement of the draft and exhaust passages in a locomotive smoke-stack, whereby the amount of draft is made subject to the control of the engineer without affecting the steam exhaust, which is left entirely free, so as to allow the steam its full efficiency at all times; and particularly to avoid the creation of back pressure in the cylinder by the act of increasing the draft when the force of the engine is most in demand.

Fig. 1 is a side elevation of a smoke-stack and smoke-jacket embodying my improvement, a portion of the enclosing plate being moved.

Fig. 2 is a transverse section of the same.

A is the external shell of smoke-box; B are flues leading into smoke-box; C is the external shell of stack; D, exit flue; E, adjustable throat to exit flue and constituting lower portion thereof.

A rack F and pinion G, under control of the engineer, enables him to depress or elevate the throat E at will, and thus, by varying its proximity to the steam exhaust nozzles H, to modify the draft without any interference with the discharge of steam.

Thus, if the hood be lowered until its lower edge is but little above the nozzles then the escaping steam will pass directly into escape flue, and create a powerful draft.

The object of such increase of draft is, of course, an increased efficiency of the engine, and where this is accomplished, as in plans in use, by contracting the exhaust orifice, this is partly counteracted, as such action tends to confine the escaping steam and to create a pressure on the back of the piston which, to the extent which it exists, neutralizes just so much of the effective action of the live steam.

I is a perforated cylindrical box or screen, through whose apertures the smoke must pass in reaching the throat E.

These apertures may consist chiefly or wholly of latitudinal slots K, which slots can be closed to any desired extent by means of a correspondingly perforated cylindrical register L, operated by a rack M and pinion N, under the control of the engineer. This arrangement of screen, adjustable both as to size of individual apertures and of the entire area of smoke passage, enables the engineer to graduate the screen so as to avoid the escape of sparks, while it may also be employed as a very efficient damper when need be. An upper portion of the screen may consist of wire gauze O. P is a trap for spent sparks.

I claim as new and of my invention herein—

1st. The arrangement of a shifting throat E, in combination with the exhaust steam and smoke passages, substantially as and for the purposes set forth.

2d. Providing the smoke passage of a locomotive with a screen I, having apertures, K, closable by a register L under control of the engineer, as and for the purposes set forth.

In testimony of which invention I hereunto set my hand.

JAMES L. VAUCLAIN.

Witnesses:
GEO. H. KNIGHT.
FRANCIS MILLWARD.

Weidman. Major. & Sample, 188

Spark Arrester.

No. 110,315. Patented Dec. 20. 1870.

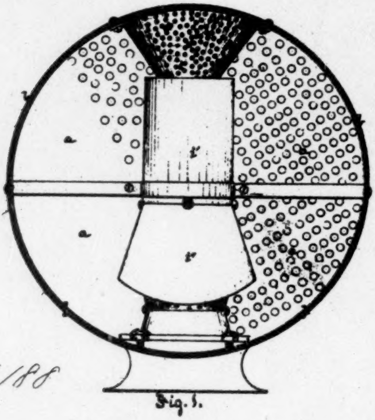


Fig. 1.

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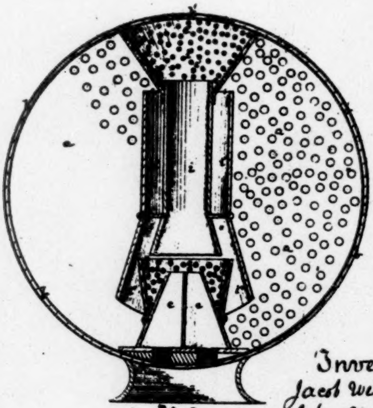

Fig. 2.

Witnesses:

R. D. Wrenshall

Geo. B. Kerr

Inventors:
Jacob Weidman,
John Major,
John J. Sample,
by Bakewell & Christy,
their Att'ys.

189

UNITED STATES PATENT OFFICE.

JACOB WEIDMAN, JOHN MAJOR, and JOHN J. SAMPLE, of Pittsburg, Pennsylvania.

Letters Patent No. 110,315, dated December 20, 1870.

Improvement in Spark-arresters.

The schedule referred to in these letters patent and making part of the same.

To all whom it may concern:

Be it known that we, Jacob Weidman, John Major, and John J. Sample, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful improvement in double-cone spark-arrester; and we do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing making a part of this specification, in which—

(Here follows diagram marked p. 188.)

Figure 1 represents a front elevation of the open smoke-chamber of a locomotive-boiler.

Figure 2 is a vertical cross-section thereof, through the axial line of the smoke-pipe.

Like letters of reference indicate like parts in each.

Our improvement relates to the construction and combination of devices for preventing the discharge from locomotive smoke-stacks of live or burning sparks.

The force of the draught, under the effect of the exhaust, it is well known, often carries out from the smoke-stack burning sparks of fire, which, alighting on some combustible object, are frequently a cause of great loss.

To enable others skilled in the art to make and use our improvement, we will proceed to describe its construction and mode of operation.

In the drawing—

a represents the flue sheet;

b, the cylindrical inclosure of the smoke-chamber; and

c c, the steam exhaust-flues, all of the usual or any known construction.

Around the base of the exhaust-flues *c c* we arrange an inverted, finely perforated cone, *l*, somewhat like the perforated frame of an ordinary carbon oil lamp-burner.

From at or near the upper end or base of this inverted cone we commence the imperforate smoke-pipe *i*, which extends up to a similar finely perforated inverted cone, *e′*, the base of which latter is fastened to the part *b* just under the stack-opening *b′*.

Outside the pipe *i*, and at a little distance from it, is a draught-pipe, *i′*, the lower end of which is funnel-shaped, as at *i″*, and comes down over the joint of the pipe *i* and perforated cone *e*, coming nearly down to the lower end of the cone.

The upper end of it extends up nearly to the upper cone *e′*.

The operation of the devices described is then as follows:

The steam, escaping with great force alternately from the exhaust-flues *c c*, creates a strong draught through the boiler-flues from the fire-box.

The direction of the force thus exerted causes the smoke to enter the pipe *i* through the perforations of the cone *e*, and pass up and out at the stack.

The sparks of fire which are drawn through the boiler-flues are thus drawn against the outer face of the cone *e*, but, on account of the fineness of the perforations in the cone, they cannot pass through it.

The draught of smoke and steam up the pipe *i*, and from the smoke-chamber through the upper cone *e′*, causes a strong draught up the chamber *s* between the pipes *i* and *i′*.

This carries the sparks up the chambers against the outer face of the upper cone *e′*, from which they are thrown off outwardly, to be again carried into the line of the draught, carried against the lower cone *e*, up the chamber *s*, against the cone *e′*, and so on continuously until they not only become cold, but, also, are so broken up that they will pass through the perforations of the cones and be carried off as fine dust.

By the use of the central pipe *i* of a moderate diameter, and extending through the greater part of the height of the smoke-chamber, we secure a powerful draught, and by the use of the double-cone arrangement, as set forth, we combine therewith an effective spark-arrester, which will not only prevent the escape of burning sparks, but breaks them up and throws them off when cold.

We also find that by the use of these devices we are enabled to enlarge the discharging apertures of the exhaust-pipes *c c*.

If these apertures are made small they produce a quick sharp draught, which tears up the fire and draws it through the flues.

Our improvement, by concentrating the force of the draught in the pipe *i*, enables us to make the exhaust-pipes *c* larger, and thereby secure an equally powerful but more uniformly-acting draught.

The fire is drawn through less rapidly and a large amount of fuel is accordingly saved.

What we claim as our invention, and desire to secure by letters patent, is—

1. The imperforate double-pipes *i i′*, arranged in and extending through the greater part of the height of a locomotive smoke-chamber, the inner one being of a uniform, or nearly uniform, diameter, through the greater part of its length, and the chamber *s* between the pipes *i i′*, opening at both ends into the smoke-chamber, substantially as described.

2. The perforated cones *e e'*, one in the upper part and the other in the lower part of a locomotive smoke-chamber, arranged with an imperforate pipe connecting them in the line of draught, the latter being surrounded with one or more draught-pipes *i'*, substantially as described.

In testimony whereof we, the said Jacob Weidman, John Major, and John J. Sample, have hereunto set our hands.

JACOB WEIDMAN.
JOHN MAJOR.
JOHN J. SAMPLE.

Witnesses:

A. S. NICHOLSON.
THOS. B. KERR.

191

UNITED STATES PATENT OFFICE.

ALLEN S. SWEET, JR., of Detroit, Michigan.

Improvement in Smoke-stacks for Locomotives.

Specification forming part of Letters Patent No. 38992, dated June 23, 1863.

To all whom it may concern:

Be it known that I, Allen S. Sweet, Jr., of Detroit, in the county of Wayne, in the State of Michigan, have invented certain new and useful improvements in stacks for locomotives; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, forming a part of this specification, all of which is prepared with a view to the obtaining of letters patent therefor.

(Here follows diagram marked p. 190.)

In the drawings, figure 1 is a longitudinal vertical section through the entire stack and all the parts thereof. Fig. 2 is a like section, with lines showing the currents of gases; and Fig. 3 is a transverse vertical section through the exterior work of the stack, but exhibiting the interior work in elevation. Fig. 4 is a horizontal section of the stack on the line S S in Fig. 1.

Similar letters of reference indicate like parts in all the figures.

My invention is equally applicable to all locomotives, either wood or coal burners. Coal ordinarily throws out with its products of combustion few, if any, of those pieces of solid burning matter which are termed "sparks," and it is therefore not common to provide coal-burning locomotives with devices for preventing the escape of such; but as all locomotives burn some wood, it happens that coal-burning locomotives, by reason of their throwing out sparks without check or hindrance, when any occur, are the source of frequent and sometimes very destructive fires in the buildings, grass, or woods adjacent to the railroad. My invention is intended to avoid all this danger, and also to save to those in charge of the locomotive the care and trouble due to any of the adjustable or removable screens, bonnets, &c., sometimes used. It is intended to take care of itself under all ordinary conditions, and in wood-burning to grind or burn up and completely consume the sparks as fast as they are produced, without ever accumulating any to do harm, and to insure a powerful draft at all times, because there is no obstruction in the way of the free escape of the exhaust-steam which comprises three-fifths of the whole volume passing the pipe, none of which is brought in contact with the screen or netting.

To enable others of proper skill who are familiar with the several devices for this purpose before known to make and use my inven-

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A. S. Swett, Jr.,

Spark Arrester,

No. 38,992.

Patented June 23, 1863.

Fig. 3.

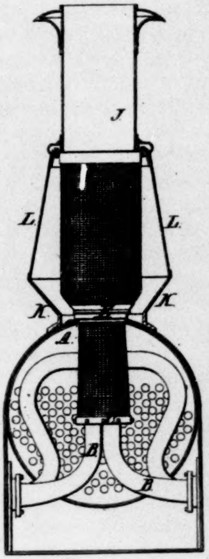


Fig. 1.

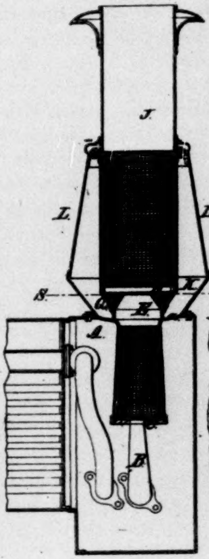


Fig. 2.

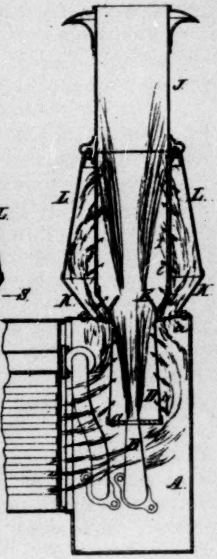
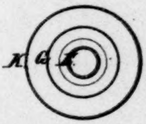


Fig. 4.



Witnesses.

Ebenezer Benham

George Ruhland

Inventor.

A. S. Swett

tion, I will proceed to describe its construction and operation by the aid of the drawings, and of the letters marked thereon.

A is the smoke-box of a locomotive, and B B are the exhaust-pipes.

C is a plate of cast iron, which is fixed horizontally in the position represented, and is perforated to receive the nozzles or upper ends of the pipes B B. These nozzles are directed upward parallel, or nearly so, each to the other, and, except in the fact that they may be larger, and consequently may discharge the steam more freely than usual, they differ in no important respect from the ordinary exhaust-nozzles of locomotives. They may be placed lower or higher than represented without defeating the object of my invention.

D is a hollow cylinder or slightly-tapering frustum of a cone made of wire-gauze. It is secured to the plate C at its lower edge, and to the ring E at its upper edge, and forms a casing of wire-gauze around and at a little distance from the jets of steam which issue from the nozzles B B. The general form of the ring E is shown very clearly in the drawings. Its upper portion is conical, and the area of opening through it at its upper edge is somewhat less than the area of the cross-section of the wire-gauze casing D.

G is a hollow case of wire-gauze in the form of a frustum of a cone fixed with its smaller end downward upon the ring E, being secured thereto at about the middle of its height, as represented.

H is a narrow ring of metal, which unites the conical case G with a further casing of like material, I, which is of much greater diameter than the casing D, and extends upward in a cylindrical or slightly conical form along the stack, as represented. This wire-gauze casing I is joined at its upper edge to a sheet-metal continuation, J, which is open at the top, like the top of an ordinary stack for a coal-burning locomotive.

The aperture in the top of the smoke-box A is represented by *a*, and is so much larger than the ring E as to allow a considerable annular space around the latter, through which a portion of the products of combustion may flow. Said annular space is to be of a diameter much less than the cross-section of the chamber above, in order to prevent the too rapid escape of caloric, and at the same time giving greater freedom to the sparks and gases after passing the same.

K is a lower conical portion of the exterior of the stack, placed with its larger end uppermost.

L is a conical part fixed in the reverse position above K, and secured thereto. The upper edge of L is also secured to the top of the upper wire-gauze casing, I, and to the base of the top piece, J, of the stack. The gauze or bonnet is held in place at the top by simply pinching the same between the flanges of L and J, as shown.

The several parts may be secured together, and adapted to connect and disconnect from each other by any approved means. The rods *i*, lying just within the upper wire-gauze casing I, are employed for this purpose, and braces, (represented), screw-bolts, hooks, and other devices (not represented) may be employed throughout the entire structure to strengthen and aid in handling, cleaning, or repairing the parts.

The operation and effect of my invention may be readily understood from Fig. 2, with a brief explanation. The wire-gauze always allows the easy passage of the gases, and consequently the draft is sufficiently good while the engine is firing up or is standing at a station. When the engine is starting, blasts of exhaust-steam are expelled as usual through the nozzles B B. This exhaust-steam is projected directly up through the interior of D, spreading as it ascends. The ring E receives the spreading jets of steam and the gaseous products of combustion which have been drawn in through the wire-gauze casing D, to accompany it and contracts it, thereby producing a secondary jet above this ring, which is less efficient than the original one, and this secondary jet spreads itself and draws in the remainder of the gaseous products of combustion through the wire-gauze casings G and I. The contraction of the ascending stream in its passage through E necessarily retards its ascent, and sensibly moderates the force with which the gases are drawn in through D. This effect is a desirable one, inasmuch as the position of D around the base of the ascending jet of steam and directly opposite the boiler-tubes, together with the narrowness of the annular space *a*, conspire to render the passage of the gases through a given area of D more rapid than through a given area of G and I. The area of the aperture through the contracting-ring E is so proportioned to the other parts that the retardation due to this ring exactly or very nearly balances the tendency to a more violent induction of the gases through D, and induces a practically equal force of induction over the whole area of the wire-gauze casing or casings D G I. The sparks are stopped by the wire-gauze, while the gaseous products of combustion with which the sparks are mingled, and by which they are supported, are transmitted through the interstices of the wire-gauze, the motion being always from the exterior toward the interior. The considerable extent of surface of wire-gauze thus uniformly efficient and arranged to transmit the gases alone renders the retardation of the gases by the presence of the wire-gauze almost insensible, and the absence of any steam in contact with the sparks allows each spark, while standing still or moving upward on the exterior of the gauze, to continue its combustion, by virtue of the little free oxygen always present in the gases, and thus to burn out and pass away without difficulty.

Having now fully described my improved stack, what I claim as new therein, and desire to secure by letters patent, is—

1. In the stacks of locomotives, the employment of the concentric deflector E or equivalent contracted casing arranged over the exhaust nozzle or nozzles, and within any suitable casing or casings of perforated material, so as to operate substantially in the manner and for the purpose herein set forth.

2. In the stacks of locomotives, the combination and arrangement of an inner perforated stack or strainer with a contracting

ring or rings, a narrow annular space, *a*, and an external stack of the form and character substantially as described—that is to say, the inner stack, D G I, or its equivalent, the contracting-ring E, and the outer chamber, I K L, arranged substantially as described, so *us* to present a narrower space, *a*, around the ring E than is afforded above, substantially as and for the purpose herein set forth.

A. S. SWEET, Jr.

Witnesses:

EBENEZER BENHAM.
GEORGE RUHLANDS.

193

UNITED STATES PATENT OFFICE.

JAMES SMITH, of Altoona, Pennsylvania.

Improvement in Spark-arresters.

Specification forming part of Letters Patent No. 106,515, dated August 16, 1870.

I, James Smith, of Altoona, county of Blair, State of Pennsylvania, have invented certain improvements in spark-arresters, of which the following is a specification:

Nature and Object of the Invention.

My invention relates to an improvement in spark-arresters for locomotives; and it consists mainly of a perforated (or grated) tube, communicating with the exhaust-nozzles and smoke-pipe, and surrounded within the smoke-box by a sleeve or lift-pipe, the sparks being caused to pass through the annular space between the sleeve and grater-like surface of the inner pipe, and being thus ground to powder and caused to pass through the perforations of the latter before entering the smoke-pipe, all of which will be fully described hereafter.

Description of the Accompanying Drawing.

(Here follows diagram marked p. 192.)

Figure 1 is a longitudinal sectional view of a locomotive-boiler and smoke-box with my improvement, and Fig. 2 a transverse section of the same on line 1 2, Fig. 1.

General Description.

S is the outer shell of the locomotive-boiler, at the front end of which is the usual smoke-box T, and above the latter projects an ordinary open smoke-pipe, P.

Into the lower part of the smoke-chamber extend the exhaust-nozzles E E, which communicate with the contracted lower end of a tapering perforated pipe, A, the latter communicating at its upper end with the lower end of the smoke-pipe P.

The perforations in the pipe A are sufficiently numerous to permit the smoke and gases to pass freely from the smoke-box without interfering with the draft, these perforations constituting the sole means of communication between the chamber and pipe P. They are, however, of such a size as to effectually prevent the passage through them of all cinders not in the form of dust.

The pipe A is inclosed by a sleeve or lift-pipe, B, which extends to within a short distance of both the top and bottom of the cham-

J. Smith,   192

Spark Arrester.

No. 106,515.   Patented Aug. 16. 1870.

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Fig 2.

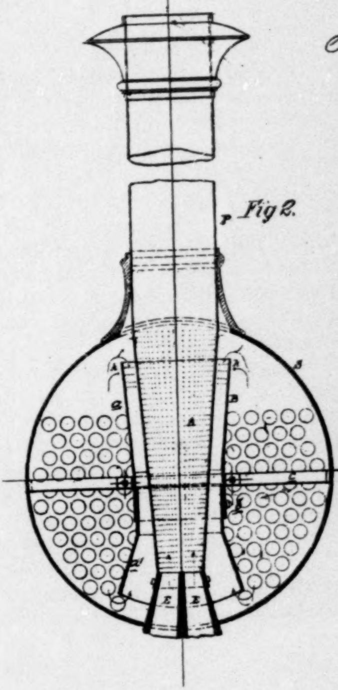
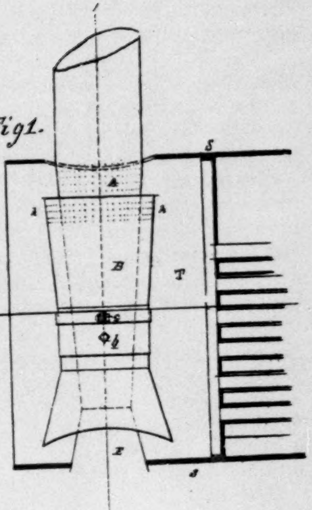


Fig 1.



Witnesses { Wm A. Steel
John Parker

James Smith
by his Attys
Howson and Son

ber T, and is in two sections, *a a'*, the upper section, *a*, being secured to a cross-bar, *c*, and flaring outward toward the top, and the lower section, *a'*, flaring outward toward the bottom and extending into the lower end of the section *a*, so as to be adjustable within the latter to a slight extent vertically, being surrounded by set-screws *b*. Near the upper end of the sleeve B are perforations *h*, for a purpose described hereafter.

The passage of exhaust-steam into the pipe A creates an upward draft in the said pipe and an upward current in the annular space between the pipes A B. When, therefore, the products of combustion and cinders from the fire-box enter the smoke-chamber T they are drawn into the lower end of the tube B, the gases and fine particles of the cinders or dust passing through the perforations in the pipe A and being thrown upward through and out of the smoke-pipe, while the heavier cinders pass upward over the upper edge of the pipe B and downward to the bottom of the chamber T below the pipe B, into which they are again carried by the current, as before.

As the heavier cinders pass upward they are thrown violently against and traverse the inclined surface of the pipe A, and are thereby grated and wholly or partially broken up, the fine particles passing into the pipe A, from which they are discharged, while the coarser cinders again pass upward into the chamber T and down again into the pipe B, time after time, until by constant friction against the pipe A they are entirely reduced to powder and discharged.

As the force of the current, if not interrupted, would be apt to carry some of the fine particles out of the pipe B into the chamber T, the pipe B is perforated near the upper edge to permit the air to pass into the pipe laterally and create a counter-current toward the pipe A, and thus insure the passage of all the dust in the latter.

The lower section, *a'*, of the pipe B may be adjusted as desired to regulate the current and the movement of the cinders, and the form of the pipes may be changed, it being essential, however, that the cinders should be obliged to repeatedly strike against and traverse a perforated pipe or casing until they are broken into fine dust and carried into such pipe or casing.

It will be apparent that the outer surface of such pipe or casing may be serrated to insure a more rapid and thorough division of the cinders.

My invention, it should be understood, is as applicable to wood-burning as to coal-burning locomotives.

Claims.

1. A perforated pipe situated within the smoke-chamber and communicating with the smoke-pipe and exhaust-pipes of a locomotive, in combination with a sleeve or casing so arranged that an upward current shall cause the cinders to pass upward from the lower part of the smoke-chamber and strike and traverse the perforated surface of such pipe, substantially as described.

2. The perforated pipe A, when tapered as described, in combination with the sleeve or pipe B, having a flaring lower end.

3. The pipe B, consisting of a stationary section, *a*, and adjustable section *a′*, arranged substantially as specified.

4. The perforations *h* in the outer pipe, B, for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAS. SMITH.

Witnesses:

W. A. MALONEY.
GEO. W. STRATTAN.

194

J. Smith,

Spark Arrester.

No. 112,506. Patented Mar. 7. 1871.

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Fig. 1.

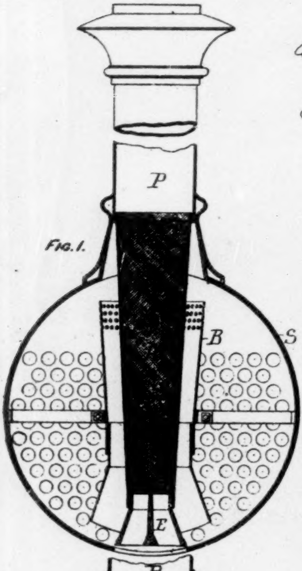


Fig. 2.

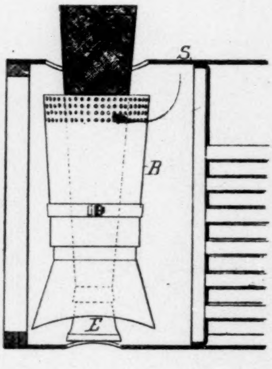


Fig. 3.

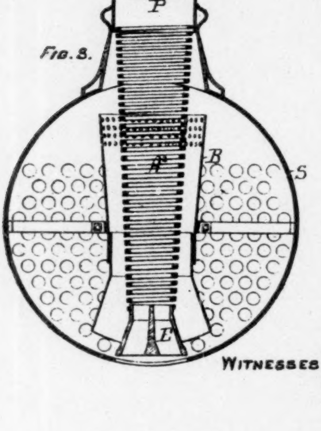
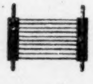


Fig. 4.



James Smith
by his Attys
Howson & Son

Witnesses { John Parker
Jno. B. Harding

195 UNITED STATES PATENT OFFICE.

JAMES SMITH, of Altoona, Pennsylvania.

Improvement in Spark-arresters.

Specification forming part of Letters Patent No. 112,506, dated March 7, 1871.

I, James Smith, of Altoona, county of Blair, State of Pennsylvania, have invented an improved spark-arrester, of which the following is a specification:

Nature and Object of the Invention.

My invention relates to an improvement in or addition to the invention for which letters patent were granted to me on the 16th day of August, A. D. 1870, my present improvements, which are too fully explained hereafter to need preliminary description, having for their object the arresting and destruction or disintegration of sparks arising from wood or hard-coal fires.

Description of the Accompanying Drawing.

(Here follows diagram marked p. 194.)

Figure 1 is a transverse vertical section of the smoke-box of a locomotive with my improved spark-arrester; Fig. 2, a longitudinal section of the smoke-box, showing an external side view of the spark-arrester. Fig. 3 illustrates a modification of my invention, and Fig. 4 another modification.

General Description.

S represents the shell of the smoke-box, and P the chimney of a locomotive-boiler.

Into the lower end of the smoke-box projects the usual exhaust-nozzle E, between which and the chimney is a tubular tapering casing, A^1, the latter in my aforesaid patent consisting of perforated sheet metal. This casing is surrounded by a shield or casing, B, an annular space intervening between the two, as shown in the drawing, and the upper portion of the said casing B being either straight or tapering, and extending to within a short distance from the top of the smoke-box, while the lower end is flared and terminates a short distance from the bottom of the said smoke-box.

The draft created in the chimney by the exhaust-steam causes the smoke and cinders to pass upward between the two casings, the smoke escaping freely through the perforations in the casing A, and the ignited cinders coming violently in contact with the same, so as to be more or less broken or triturated, the finer particles passing through the perforations, whence they are discharged through the chimney in a harmless condition, while the coarser particles rise and fall between the two casings until by repeated violent contact with the casing A they are grated to particles fine enough to pass through the perforations.

The casing B is perforated near the upper edge, so as to form a counter or downward current, to prevent the lighter particles from passing upward through the top of the said casing.

The above description applies to the device illustrated and claimed in the aforesaid patent, and, as regards the operation of the invention, will apply to my present application. I have found, however, that in using some classes of fuel a perforated casing is not as efficient as a casing, A^1, Figs. 1 and 2, of wire-gauze, which affords a free escape for the products of combustion, and at the same time arrests the light cinders and affords an excellent surface for the abrasion and disintegration of the same. A wire-gauze casing may, for instance, be employed to the best advantage when wood is used as a fuel.

When hard coal is used, however, I prefer to use a grated casing or tube, A^2, as shown in Fig. 3. This may be made by a continuous bar of wrought iron coiled spirally, as shown; or it may be composed of a number of cast-iron rings strung to thin rods, as shown in Fig. 4; or the grating may be made in any other desired manner, providing it presents rigid bars for the hard ignited cinders to strike against, and providing there are openings sufficient in number and size to permit the free escape of lighter particles with the products of combustion.

Claim.

The combination of the shield or casing B and a grated or wire-gauze pipe or casing, A^1 or A^2, the whole being arranged in the smoke-box of a boiler, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAS. SMITH.

Witnesses:

W. A. MALONEY.
GEO. W. STRATTAN.

Kearney & Tronson, 196

Spark Arrester.

No. 113,528. Patented Apr. 11. 1871.

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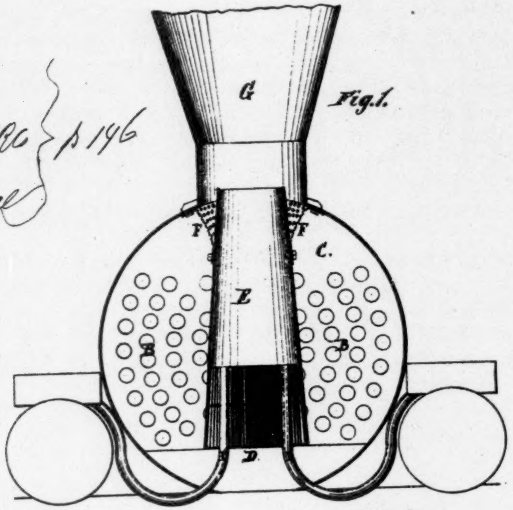
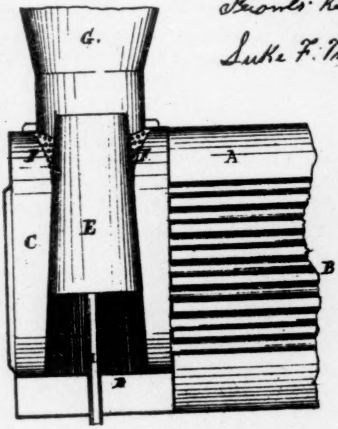


Fig. 1.

Inventors.
Francis Kearney
Luke F. Tronson

Fig. 2.



Witnesses.
D.H. Crawford } attest
Edward C. Ellwor

197 UNITED STATES PATENT OFFICE.

FRANCIS KEARNEY and LUKE F. TRONSON, of Newark, New Jersey.

Letters Patent No. 113,528, dated April 11, 1871.

Improvement in Spark-arresters for Locomotives.

The schedule referred to in these letters patent and making part of the same.

We, Francis Kearney and Luke F. Tronson, of the city of Newark, county of Essex and State of New Jersey, have made certain improvements in spark-arresters in locomotives, of which the following is a specification.

The improvement relates to effectually preventing hot coals passing from the chimneys of locomotives, arresting them before they get to the chimney.

On the forward end of a locomotive-boiler is an extension, on the top of which is the chimney or smoke-stack.

This receptacle of all that passes through the boiler-flues to the smoke-stack is technically known as the smoke-head. The pipes from the boiler to the engine pass through the smoke-head, and the steam is exhausted thereinto from the cylinders.

In the unoccupied space in this smoke-head we place a grate, the peculiar features of which are its perpendicular bars with fixed apertures sufficiently fine to stop the sparks that come from the fire, the size of the grate being determined by the area of opening needed for the regular draught and escape of smoke on kindling the fire, or when the engine is not in motion.

Upon the top of the grating a tube or pipe is fitted, extending upward a short distance above the top of the smoke-head into the chimney. A space is left around the top of the pipe between the edges of the aperture in the top of the smoke-head and the pipe. This space is covered with netting or grating to prevent sparks or coals from passing through into the chimney.

(Here follows diagram marked p. 196.)

In the accompanying drawing—

Figure 1 is a view in section of the front of the smoke-head with the gratings and pipe in position.

Figure 2 is a side view of the end of the boiler and of the smoke-head.

A is the boiler.

B, the flues.

C, the smoke-head.

D, the grate.

E, the pipe on the top of the grate.

F is the netting closing the aperture between the pipe and the smoke-head;

G is the chimney or smoke-stack; and

I, the exhaust-pipes from the engines.

It will be seen that nothing but smoke and gas can pass the top netting F, and that no coals or dangerous sparks can pass into the chimney, they being arrested by the grate D without having received any impulse from the exhaust-pipes.

The strong draught created by the exhausting steam up the pipe into the chimney brings the coals and sparks to the grating, against which they strike and fall harmless into the space in the smoke-head.

By our arrangement the gases that are returned by contrivances that turn sparks downward in the smoke-stack, and sometimes force open the fire-door, have a clear passage to the atmosphere.

We disclaim all draught-regulating contrivances, and also all gratings with lateral adjustable openings.

What we do claim as our improvement, and desire to secure, is—

The grate D with longitudinal bars, as and for the purposes specified and shown.

FRANCIS KEARNEY.
LUKE F. TRONSON.

Witnesses:
WM. M. GOODING.
FDWARD COLLVER.

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198

F. KEARNEY & L. F. TRONSON.

Spark-Arresters for Locomotives.

No. 5,184. Reissued Dec. 10, 1872.

No 314.
Lehigh Valley RRC
v
Kearney et al. } p 198

Fig. 1.

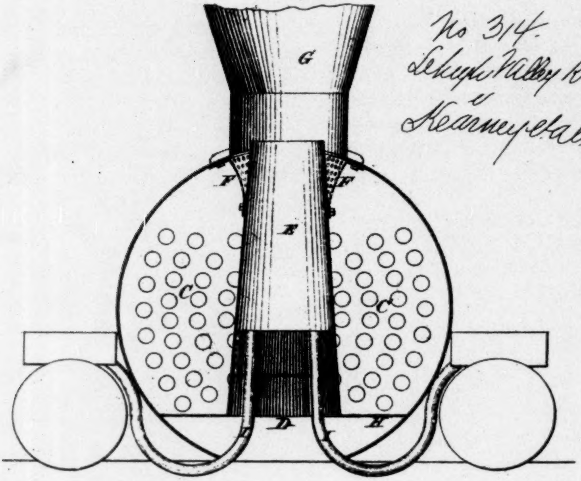
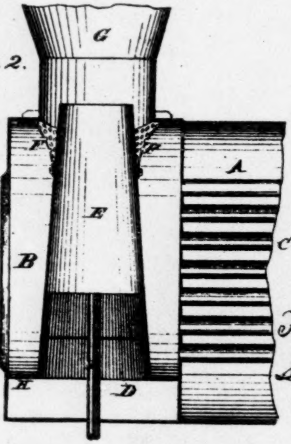


Fig. 2.



Witnesses:
D. H. Crawford
Edward Collier

Inventors:
Francis Kearney
Luke F. Tronson

199 UNITED STATES PATENT OFFICE.

FRANCIS KEARNEY and LUKE F. TRONSON, of Newark, New Jersey.

Improvement in Spark-arresters for Locomotives.

Specification forming part of Letters Patent No. 113,528, dated April 11, 1871; Reissue No. 5184, dated December 10, 1872.

To all whom it may concern:

Be it known that we, Francis Kearney and Luke F. Tronson, both of the city of Newark, county of Essex, and State of New Jersey, have invented certain new and useful improvements in spark-arresters for locomotives; and hereby declare the following to be a full and clear description of the same, reference being had to the accompanying drawing, in which—

(Here follows diagram marked p. 198.)

Figure 1 is a vertical cross-section of the smoke-box of a locomotive with our improvements attached, and Fig. 2 is a vertical longitudinal section of the same, and a portion of the boiler.

The letters of reference indicate the same parts in both figures.

A represents a portion of the boiler of a locomotive. B is a space, commonly called the smoke-box. C C are the flues at the point where they enter the smoke-box; E is a pipe extending from within the base of the smoke-stack down into the smoke-box, and commonly termed a "petticoat-pipe." D is a grating placed at the lower part of the petticoat-pipe to prevent any cinders or sparks passing into the same. F is a netting or grating placed around the top of the petticoat-pipe so as to cover the annular opening caused by the difference in size of the upper part of the petticoat-pipe and the bottom of the smoke-stack G. H is a piece of boiler-plate or sheet-iron placed at the bottom of the smoke-box in order to provide a flat surface for the grate D to rest upon, and is provided with holes, through which the exhaust-pipes I I pass.

Our improvements relate to providing locomotives with a suitable device for preventing live coals, cinders, sparks, and like substances, which may leave the furnace, from passing into or out of the smoke-stack, and to retain them in the smoke-box, from which place they may be removed at pleasure.

It has heretofore been the practice to cover the tops of smoke-stacks of locomotives with a wire netting or grating for the purpose of preventing the escape of sparks and cinders; and, in some cases, an inverted metal cone is also placed in the center of such netting or grating to receive and break the force of the cinders as they are thrown against it. In all of these contrivances the cinders receive so much force from the exhausting steam while on their way up the petticoat-pipe and smoke-stack that they very soon destroy the netting or grating placed at the top of the smoke-stack, and where a cone or other device is used to turn the cinders downward and partially protect the grating the gases are also retarded in their escape.

In order to overcome these difficulties, we place a grating, D, at or near the lower end of the petticoat-pipe E so as to surround the exhaust-pipes I I and prevent any cinders or sparks entering the pipe E, while allowing free passage for the smoke and gases. We also place a grating or netting, F, around the top of the petticoat-pipe to cover the aperture left between it and the smoke-stack in order to arrest any sparks or cinders that may be drawn to that point.

We construct the grating D with straight vertical bars of iron, placed at small distances apart, but these spaces should be such, in the aggregate, as will be sufficient for the draft and escape of the smoke, on kindling the fire, or when the engine is not in motion.

By this arrangement nothing but smoke and gas are allowed to pass the netting F, and no coals or dangerous sparks can pass out of the smoke-box into the petticoat-pipe, they being arrested by the grating D before having received any very great impulse by reason of the exhaust-pipes. The strong draft up the pipe E and smoke-stack brings the greatest portion of the cinders and sparks to the grating D, against which they strike and fall harmless to the bottom of the smoke-box, while the smoke and gases have free and uninterrupted egress through the petticoat-pipe and smoke-stack, they being perfectly clear; and the gratings D and F are not liable to be injured by the cinders striking against them, as they are arrested before having obtained the force they would have if allowed to pass up into the smoke-stack.

What we claim as our invention, and desire to secure by letters-patent, is—

1. The grating D with vertical bars placed at the foot of the spark or petticoat pipe E, in the manner and for the purpose substantially as described.

2. The combination of the grating D with the netting F, in the manner and for the purpose substantially as described.

FRANCIS KEARNEY.
LUKE F. TRONSON.

Witnesses:

MUNSON G. DOREMUS.
A. B. MALCOMSON, Jr.

Corrections in Reissue Letters Patent No. 5184.

It is hereby certified that in reissued letters patent No. 5184, granted December 10, 1872, to Francis Kearney and Luke F. Tronson, for an improvement in "spark-arresters for locomotives," the reference letter in lines 62 and 82 of the printed specification was inadvertently printed "F" instead of "D;" and that the specification should be read with this correction to make the same conform with the files and records of the case in the Patent Office.

Signed, countersigned, and sealed this 20th day of March, A. D. 1883.

[SEAL.]

M. L. JOSLYN,
Acting Secretary of the Interior.

Countersigned:
E. M. MARBLE,
Commissioner of Patents.

200 United States Circuit Court, District of New Jersey.

Francis Kearney and Mary F. Tronson
vs.
The Lehigh Valley Railroad Company.
In Equity.

Rebuttal testimony taken on the part of complainants, pursuant to agreement of counsel, before the subscriber, at his office, Newark, N. J., on this 26th day of May, 1887, at 10 o'clock a. m., in the presence of Elwood C. Harris, solicitor — complainants, and Andrew McCallum, solicitor of defendants.

Oscar Durand sworn for complainant- in rebuttal.

Direct examination by Mr. Harris:

I reside at Manasquan; am an engineer on the N. J. Central railroad, Long Branch division. I have been a locomotive engineer for thirty years; twenty-five years on the N. J. Central. I have run a locomotive having on it a Kearney & Tronson spark-arrester about thirteen or fourteen years ago. I do not know how it came to be put on the engine I was running.

201 Q. (Witness, being shown Complainants' Exhibit 5, is asked:) Is this grating the same form as that which composed the spark-arrester which you used?

A. It was the same as that, but I don't think the openings were as long as that. They were about two inches long, but there was a bar between. It was Kearney & Tronson's spark-arrester.

Q. About how long did you run the locomotive with that arrester?

A. I can't tell. I ran it a little over a year, I think.

Q. Do you know whether it was put on by a Mr. John H. Immen?

A. Mr. Immen was the agent, I believe, for the spark-arrester, but whether he put it on or not I can't tell.

Q. Do you know whether or not it was put on for the purpose of trying it?

A. It was.

Q. During the time it was on was the engine being used constantly?

A. Pretty much all the time; yes, sir.

Q. Was more than one spark-arrester or set of gratings put on while you run it?

A. If I recollect right, I think they experimented with it along at first when it was first put in. It is so long ago I don't remember. I think they changed it once, but that was along when it was first put in.

Q. Then most of the time the same grating was being used?

A. Yes, sir.

Q. Do you know how it came to be taken out?

—. It was after I left the engine it was taken out.

202 Q. Do you remember whether you requested as a favor to you that it should be left in that you might have the use of it?

A. I don't remember. Immens made a present of the casting when they went away.

Q. So that it might remain in your locomotive?

A. I suppose so.

Q. How did this spark-arrester work in your locomotive?

A. It worked very good when I run it at that time.

Q. Did it ever clog up by pieces of coal sticking in the slots?

A. No, sir.

Q. Did the engine ever fail to make steam by reason of coals stopping up the slot?

A. Never that I remember.

Q. Was it ever necessary to open the smoke-head and clear the slots?

A. I never remember of cleaning the slots.

Q. Do you know whether or not the castings at the end of the time you used it were worn or broken by its use to any extent?

A. I think, if I remember right, a couple of those bars were broken in the back—three or four of them. I mean the plates next to the flues. They were only cracked, not broken out.

Q. Previous to the putting in of the Kearney & Tronson arrester what was used in the locomotive that you run?

A. We used a diamond stack, short exhaust, and petticoat pipe. There was a netting over the top of the smoke-stack to stop the sparks. 203

Q. Do you know how often that netting had to be renewed?

A. That is good deal owing to the size of the cone; about every year, I should say.

Cross-examination by Mr. McCallum:

Q. Do you remember the name of the engine on which this so-called Kearney & Tronson spark-arrester was used?

A. Engine "Ocean," No. 57.

Q. Can you state what year it was when it was put into use?

A. Really, I can't tell whether it was 1874; I don't recollect; it might have been earlier than that.

Q. What makes you remember it at all?

A. From the fact that I left the N. J. Central division and was transferred to the Long Branch division on the 5th day of July, 1875.

Q. What style of spark-arrester are you using now?

A. We are using the extension front end, long nozzle, and netting running across the top of the flues from the top row of flues to the front end of the smoke-box.

Q. It is wire netting that is used to prevent the sparks escaping through the chimney?

A. Yes, sir.

Q. What is the mesh of that netting?

A. One-quarter inch.

Q. You have said that the openings in the castings were not so long as those shown in Complainants' Exhibit 5. Did you ever use a grating like said Exhibit 5 made with two long open-
204 ings extending half way from top to bottom? I mean by that the two extending the whole way of the grating.

A. I don't recollect of ever using any of that kind.

Q. Did you ever use a grating made of wrought-iron rods or bars attached to the bottom of the petticoat pipe?

A. No, sir.

Q. How was the grating you did use attached—to a petticoat pipe or to a downward extension of the smoke-stack? I mean by "petticoat pipe" one open at both top and bottom.

A. The petticoat pipe was not open, only at the top. The petticoat pipe fitted on the casting, and at the bottom of that, on the exhaust, there was a perforated plate. The casting set on a perforated plate.

(Witness is asked to make a sketch of the device that he used on engine "Ocean," which he does, and counsel for defendant makes an enlarged and more complete sketch of the same, which witness says is substantially correct, and the same are offered in evidence and marked "Durand's sketches No. 1 and No. 2.)

Q. I understand from your answer and the sketch you have made that there was no connection between the bottom of the smoke-stack and the top of the lift-pipe. Is that correct?

A. There was none.

Q. I understand, also, that there was a magazine to catch the sparks placed beneath the exhaust nozzle and spark-arrester, and that the spark-arrester was supported by a plate attached to the nozzles. Is that correct?

A. Yes, sir; as I recollect it.

205 Q. I have marked sketch No. 2 with letters designating the different parts—"A," stack; "B," the smoke-box; "C," the petticoat pipe; "D," grating; "E," magazine or subtreasury; "F F," the cylinders. Is that correct?

A. That is correct to the best of my knowledge, with the exception of the petticoat pipe. If I had have known what they wanted of me I would have informed myself in regard to the matter. I am not sure whether the petticoat pipe went up into the smoke-stack or not, but I think it did.

Q. Can you remember if it was like the drawing now shown you? (Witness shown Defendant's Exhibit E.)

A. I do not remember.

Redirect examination:

Q. Was the top of the petticoat pipe, in size, compared with the smoke-stack, about like drawing No. 2, or was it nearly as large as the stack?

A. I don't recollect how large my stack was. I should say it was nearly as large.

Q. Can you say what the effect of this arrester was, compared with other arresters in the consumption of coal?

Objected to.

A. I done very good work with that spark-arrester, but I have done equally as good work since that time with others.

Q. Had you done as good work with any arrester used previous to this?

A. I can't say that I had.

Q. Do you now recall whether you asked specially to have this arrester left on the locomotive you were running?

296 A. I do not recollect anything about it.

Recross-examination:

Q. Did you make any special experiments with the coal used, weighing it before being used, and comparing it with the same weight used with other spark-arresters?

A. No, sir; we never weighed any coal to my knowledge.

Q. You referred to the subtreasury or magazine used in connection with the Kearney & Tronson spark-arrester. Do you think it would have worked without that magazine to catch the sparks; worked as well?

A. No, sir.

Redirect examination:

Q. What would be the difference?

A. The sparks would collect around your casting; shut off the draft.

Q. So that you would have to clean the sparks out oftener?

A. Yes, sir.

Q. Was that magazine put in the engine in order to use the spark-arrester or was — the way the locomotive was constructed?

A. The way the locomotive was constructed.

Q. When you speak of sparks collecting around the arrester do you mean sticking fast in the slots or filling up from the bottom along the arrester?

A. Filling up from the bottom; might possibly stick in the slots under circumstances. I couldn't tell about that.

—— ——.

Sworn — and subscribed before me this 25 day of May, 1887.

—— ——.

207 **THOMAS MALAY** sworn on part of complainants in rebuttal.

Direct examination by Mr. HARRIS:

I am employed by the D., L. & W. railroad as locomotive engineer and have been so eighteen or nineteen years.

Q. Did you ever run a locomotive having a Kearney & Tronson spark-arrester in it?

A. Yes, sir.

Q. State the name of the locomotive and about how long you run it with this arrester in.

A. I ran the "Port Oram," No. 65, between two and three years.

Q. You may look at Complainants' Exhibit 5 and state whether the arrester in engine No. 65 was made of a cast grating similar to this.

A. It was.

Q. Did you use soft or hard coal at that time with this arrester?

A. Used both.

Q. Were you ever troubled in making steam by reason of the slots becoming clogged with cinders?

A. No, sir.

Q. Was it ever necessary to remove cinders by reason of their sticking fast in the slots?

A. No, sir.

Q. Do you know why the arrester was taken out of this locomotive?

A. Not positively; I suppose—I know it was taken out.

208 Q. Was it while Mr. Tronson was master mechanic or Mr. Lewis that it was taken out?

A. Mr. Lewis.

Q. Was it taken out by reason of any complaint you made that the engine didn't steam well or that it clogged up?

A. No, sir.

Cross-examination by Mr. McCALLUM:

Q. When was it you run the locomotive "Port Oram"—what year?

A. I think a portion of 1871, 1872, and 1873. I can't give the exact date.

Q. Was the grating made exactly like Exhibit 5?

A. That is as near like as I can remember it; whether that is the exact size or not, I don't know.

Q. Were there only two openings in the height of it—I mean from top to bottom?

A. That is all there were, I think.

Q. Did you never use a cast grating having four or five openings in the height arranged to br-ake joints between them, like Complainants' Exhibit "Defendant's Grating"?

A. I never did.

Q. Did you ever use one made of wrought-iron rods or bars?

A. No, sir.

Q. How was the grating you did use secured in the smoke-box?

A. It was hooped together with wrought-iron hoops. There were three wrought-iron hoops, one at the top, one at bottom, and one in the middle, to hold the sections in position.

209 Q. How was it supported inside the smoke-box?

A. It was leveled off at the bottom *on* the nozzle was held by the petticoat pipe setting down over it.

Q. Was the petticoat pipe open at the upper end?

A. No, sir.

Q. (Witness is shown drawing of Defendant's Exhibit "E" and is asked :) Was it like that?

A. No; it was not like that.

Q. Was it a downward extension of the smoke-stack?

A. I don't understand the question.

Witness is asked to make a sketch showing the construction of the device as used on said engine, and does so, the parts being designated by letters—"A," smoke-stack; "B," smoke-box; "C," spark-arrester; "D," petticoat pipe, one continuous pipe from the spark-arrester to the top of the stack. The sketch is offered in evidence and marked "Malay's sketch."

Q. What kind of a spark-arrester was put into the engine after the Kearney & Tronson arrester was taken out?

A. What they call the "Standard" diamond stack, with cone and netting.

Q. What is the mesh of the netting?

A. About one-eighth of an inch.

Q. Has that been used every since?

A. Yes, sir.

Q. Is it in use on the engine you now run?

A. Yes, sir.

—— ——.

210 Sworn — and subscribed before me this 26 day of May, 1887.

—— ——,
Notary Public.

211 George S. Force sworn on part of complainant- in rebuttal.

Direct examination by Mr. Harris:

I live at Hoboken, N. J.; am employed running locomotive on Manhattan Elevated Railroad Company. Previous to 1879 I worked for the D., L. & W. railroad as engineer for about fourteen years.

Q. Did you ever run an engine having in it a Kearney & Tronson spark-arrester; and, if so, how long you run it with the arrester?

A. Engine No. 12, "Pohatcong;" run it with the arrester between two and three years.

Q. (Witness, being shown Complainants' Exhibit 5, is asked:) Was the grating forming the spark-arrester used on said locomotive like that now shown you?

A. I think the one that I had had another bar across it. There were three sections of slots. I wouldn't be positive whether it was that way or whether a hoop went round it and looked like one of those cross-bars. It was one of the first ones that was made.

Q. How was the arrester placed in the smoke-arch?

A. It was set upon a plate surrounding the exhaust nozzles; that plate was cemented down in the bottom of the smoke-arch to make it level. The petticoat pipe connected at the top of this grating and extended to the stack and filled the bottom of the stack so there was no space around it.

212 Q. Was there any trouble in the use of this arrester from coals becoming lodged in the slots and clogging them, and thus prevent the engine from making steam?

A. There never was with me.

Q. Was it ever necessary to remove sparks from their becoming clogged in the slots?

A. Never stopped up at all. (Witness explains:) If the bottom of the smoke-arch filled up over the grating, as soon as the smoke-arch was cleared the exhaust would clear the grating.

Q. You speak now of the mass of cinders which the arrester kept from going out?

A. Exactly.

Q. How often did you remove these from the bottom of the smoke-arch?

A. About twice a day, of 100 miles; that was my run—100 miles a day.

Q. About what quantity by measure would collect twice each day?

A. That would depend upon the kind of coal.

Q. Did you ever take out as much as a half bushel?

A. Yes; we did take out half a bushel. It would average about that. The smoke-arch was very shallow; not much room for any collections.

Q. Who was master mechanic of the road when it was taken out?

A. William N. Lewis.

Q. Was it taken out by reason of any complaint by you that it clogged up and prevented steam?

A. No, sir.

213 Q. Was there ever ground for any such complaint?

Question objected to.

A. Never.

Q. Was there ever an engineer on the road by the name of Bartlett?

A. Yes, sir; there was.

Q. Is he living or dead?

A. I think he was killed at Paterson.

Q. Is that the only engineer of that name that you ever knew to be on that road?

A. That is the only one.

Q. Do you know how many different gratings, if more than one, *was* put in this locomotive during the time the Kearney & Tronson arrester was used on your locomotive?

A. Only one to my knowledge.

Q. Was it worn out or broken when it was taken out?

A. I don't know. The engine was taken in for general overhauling, and when she came out it was out—the uniform stack was on her then.

Cross-examination by Mr. McCallum:

Q. What kind of a stack was on the engine "Pohatcong" when the Kearney & Tronson arrester was put on it?

A. Straight stack.

Q. Was the engine altered to a straight stack on purpose or was a straight stack on it before?

A. Altered for that purpose.

214 Q. What was on it before?

A. What we used to call a "cabbage-head stack."

Q. What do you mean by "cabbage-head"?

A. (Witness makes a sketch showing what he means by "cabbage-head," and marks it "cabbage-head.")

Q. Is not the so-called "cabbage-head" known as a diamond stack?

A. Some people call them that way. They are the same things.

Q. What do you mean when you refer to the uniform stack?

A. If an engine come in with a stack wanting repair they had an extra stack to put right on it. What would fit one engine would fit them all.

Q. What is the shape of this uniform stack on the D., L. & W. railroad?

A. Diamond or cabbage-head, same as this sketch.

Q. Will you please add another sketch showing the construction of the stack and spark-arrester with the Kearney & Tronson device attached?

A. (Witness did so and marked the same "*a*," a arrester; "*p p*," petticoat pipe; "*n*," nozzle.)

Q. Then, as I understand from your sketch, the grating was located at the bottom of the smoke-arch and supported there by a plate with cement around the nozzle. Is that right?

A. Yes, sir.

Q. And that when the sparks accumulated in the bottom of the box they rose above the slots or partially above the slots in the grating, so that you had to clean them out?

A. Used to clean them out twice a day.

215 Q. How did you clean them out?

A. By opening the front door and using a little hoe we had for the purpose—cleaning them out by hand.

Q. Of course you had to stop the engine to do this?

A. That we used to do at the end of the road when we were cleaning fires; never had to stop while in transit to clean it out.

Q. How long was the run?

A. From Hoboken to South Orange, 15 miles it was. I used to clean it out after I had run 30 miles.

Q. Of course the draft was partially stopped when the sparks accumulated above the slots?

A. They didn't accumulate far enough to stop the draft.

Q. Your run was too short for that?

A. I don't know as that is the reason of it.

Q. Suppose you had had to run 50 miles; do you not think the draft would have been stopped more or less?

A. Wouldn't had no trouble to do it with any train the engine could handle and make time.

Q. You are speaking now from experience?

A. Yes, sir; sometimes an engine would br*ake* down at South Orange and I would be called on with my engine to take the train to its destination; sometimes to Easton; Easton is 60 miles from South Orange.

Q. Do you mean to say that you have run to Easton with the locomotive Pohatcong while it had the Kearney & Tronson arrester attached to it without having to clear out your sparks?

A. Yes, sir.

216 Q. When?

A. That is a pretty difficult question. I have no dates. I run this night line there for 12 years, and it was during that period. I didn't have the Pohat. all the time I was running this night line, because the train got so heavy Mr. Lewis took her away from me and gave me a larger engine.

Q. When did Mr. Lewis give you the larger engine?

A. I think it was in 1875 that I got this larger engine—1874 or 1875.

Q. How often did you run or make the run to Easton before that time?

A. I might not have went to Easton more than once with this engine, but as far as Morristown several times.

Q. When might that once have been?

A. That question I couldn't answer. If a man don't take no dates down he can't tell.

Q. You can't say what year it was that you run the Pohatcong engine to Easton?

A. I could not.

Q. If you did it at all it must have been before you got the new engine?

A. It was while I had the Pohatcong.

Q. When was the Pohatcong altered to the cabbage-head stack?

A. It was shortly after Mr. Lewis came there as master mechanic. I have no date when he was appointed master mechanic.

Q. Wh*at* was the straight stack put onto it?

217 A. Either in 1867 or 1868; it may be 1869; one of those three years.

Q. And you say it was put on for the purpose of using the Kearney & Tronson spark-arrester?

A. Yes, sir; put on at the same time.

Q. How long was it kept on?

A. I run it on this engine between two and three years, and then it was taken off, when Lewis took it off.

Q. Will you swear that you run to Easton with that engine in the years 1867, 1868, 1869, 1870, 1871, 1872, or 1873?

A. Certainly, I would swear to that; that is a pretty wide scope.

Q. Which of the years was it?

A. That I wouldn't swear to.

Q. What makes you remember that fact and you can't remember anything else?

A. By knowing that I have been called on to go there with this engine.

Q. But you cannot say whether it was when the engine had the straight or diamond stack?

A. It was when it had the straight stack.

Q. Was it between 1867 and 1869?

A. That I can't say.

Q. Was it between 1868 and 1870?

A. As I said before, that is a question that I couldn't definitely answer, what year.

Q. Was it between 1869 and 1871?

A. I can't say the year. I answer the same as before.

218 Q. How do you know it was during the *during the* time that the engine had the straight stack that you went to Easton?

A. I know I went there with her, that is all I know, during the time she had the straight stack on.

Q. Is there any circumstance by which you remember it?

A. No, sir.

Q. Please look at the drawing Defendant's Exhibit "E," Kearney & Tronson patent, and state if the spark-arrester you used was like that.

A. That I can't say, whether it had two bars or only one; it was similar to that.

Q. How about the petticoat pipe?

A. I had a straight petticoat pipe come right over the spark-arrester and up into the stack.

Q. Did it have that upper grating to connect the smoke-stack with the top of the petticoat pipe?

A. We didn't have that.

Q. Then it wasn't the same as the drawing?

A. No; it wasn't the same as this petticoat pipe there. The petticoat pipe connected the stack so that there was no chance for sparks to escape outside of the petticoat pipe.

Q. Would any sparks escape at all as you used it?

A. Once in a while a little one would go out, but you would never see it come down.

Q. Did you ever see a spark-arrester and petticoat pipe made like that drawing?

A. Not to my knowledge.

219 Q. Did you ever see a grating made of vertical rods or bars?

A. I have not.

Q. What kind of a grating was on the locomotive Pohatcong after the Kearney & Tronson was taken off?

A. There wasn't any grating at all.

Q. What kind of a spark-arrester was used?

A. Petticoat pipe, cone, and netting.

Q. What was the mesh of the netting?

A. I think it was one-quarter mesh.

Q. What kind of spark-arrester was used on the engine you run after the Pohatcong?

A. There wasn't any spark-arrester, for I was using uniform stack, petticoat pipe, cone, and netting.

Q. What was the netting used for in that case?

A. I suppose to keep from burning the country up; to stop the fire; break it so fine it wouldn't do any damage.

Q. Was it not a spark-arrester?

A. It didn't arrest many of them, so that they accumulated in the front end.

Q. Do you think that a wire netting of quarter-inch mesh would not stop or arrest as many sparks as a grating like Complainants' Exhibit No. 5?

A. Practice shows that they do not.

Q. Do you refer to your practice?

A. Yes; I refer to mine, for the reason that when this was in (the iron grating) we had to clean the sparks out; after it was taken out they cleaned themselves out.

220 Q. What sort of spark-arrester is in use on the engine you are now running on the Manhattan Elevated road?

A. I don't remember the name of it. Some kind of a patent arrangement in the front end. A diaphra-m comes down in front of the flue and a wire netting runs right across the smoke-arch, 8 or 10 inches below the top of the smoke-arch; got what they call the "long nozzle."

Q. Does not the wire netting prevent the escape of the sparks from the engine?

A. It seems to work very successful over there—the appliances they have got.

Q. Then your experience is different on the Manhattan road from what it was on the D., L. & W., is it?

A. Yes, sir.

Q. Netting being used in both instances?

A. Yes, sir.

Redirect examination:

Q. After the Kearney & Tronson arrester was taken out and wire netting put in the smoke-stack how often was it necessary to renew the wire netting?

A. That is a question difficult to answer. A man would hardly pay attention to that.

Q. Would they wear ten years?

A. No; if they wear a year they do well.

Q. Then you think that, on an average, they have to be renewed oftener than once a year?

A. On an average.

—— ——.

Sworn — and subscribed before me this 26 day of May, 1887.

—— ——.

221 Circuit Court U. S., Dist. N. Jersey.

FRANCIS KEARNEY and MARY F. TRONSON
vs.
THE LEHIGH VALLEY RAILROAD COMPANY.

SEPT. 30, 1887.

Opinion by Bradley, Circ. Justice.

This is a suit on a reissued patent brought for an injunction and damages. The original patent was granted to Kearney & Tronson April 11th, 1871, for improvements in spark-arresters on locomotives. The spark-arrester thus patented was located in the smoke-head of the boiler instead of the smoke-stack above. It is described in the specification as follows: "In the unoccupied space in this smoke-head we place a grate, the peculiar features of which are its perpendicular bars with fixed apertures sufficiently fine to stop the sparks that come from the fire, the size of the grate being determined by the area of opening needed for the regular draught and escape of smoke on kindling the fire or when the engine is not in motion. Upon the top of the grating a tube or pipe is fitted, extending upward a short distance above the top of the smoke-head into the chimney.

A space is left around the top of the pipe between the edges of the aperture in the top of the smoke-head and the pipe. This 222 space is covered with netting or grating to prevent sparks or coals from passing through into the chimney." The claim was for "the grade D with the longitudinal bars as and for the purposes specified and shown."

The drawings show the circular grate of longitudinal upright bars, marked D, and the tube E on top of it, extending upward into the smoke-stack, with the netting, marked F, around the top of this tube to prevent cinders from escaping into the smoke-stack. The exhaust steam is brought by pipes through the bottom of the grate D and blown upward into the pipe E, creating a strong draught in the smoke-stack. Most of the smoke and gases are drawn by this draught through the grate and upward into the pipe E and the smoke-stack, but some of them ascend and pass through the netting F into the smoke-stack.

The application for the reissued patent was filed June 7th, 1872, a little more than a year after the date of the original, and was granted December 10th, 1872. The drawings accompanying the specification are the same as those attached to the original patent, and the specification is the same in substance as the original specification except that it is so framed as to correct some ambiguity and uncertainty in the original and to supply an evident omission. The ambiguity or uncertainty was this: As the original was drawn it might be construed as applying only to cases where the tube E in
the smoke-head was of less size at top than the smoke-
223 stack or orifice in the smoke-head on which the smoke-stack
stands, whereas the particular form and size of the tube E had nothing to do with the invention, which was as applicable to a pipe which filled the orifice above and was equal in diameter to the smoke-stack as to one which was smaller. The invention had relation to the form and construction of the spark-arresting grate and to that only and was as applicable to one kind of pipe as to another. This correction was a proper one to be made if made in reasonable time, as it was.

The other correction was the addition of a clause to point out and describe the platform on which the grate was to stand in the smoke-head. This platform was a necessary incident to the apparatus, as the grate could not stand on nothing. It was fairly indicated by the original drawing, but was not described in the specification. Its description in the reissue was a very proper amendment to be made. It did not affect the invention. It left that untouched, but it showed more clearly the surrounding parts related to it.

The paragraphs which explain the difficulties and defects of prior spark-arresters and how the patents have avoided them by their invention cannot be regarded as that sort of new matter which renders a reissue void.

The reissue has two claims, the first of which is substantially the
same as the claim in the original patent, and the second is
224 merely for the combination of the grate D and netting F, which
amounts to nothing. The first claim, which is the one contested in this suit, is as follows:

"What we claim, &c., is—

1. The grating D, with vertical bars placed at the foot of the spark or petticoat pipe E, in the manner and for the purpose substantially as described."

The defences are anticipation of the invention by prior patents, non-patentability of the invention claimed, and non-infringement.

Patents had been granted before this for spark-arresters located in the smoke-head and surmounted by a tube extending upward into the smoke-stack, but these generally consisted of perforated sheet-metal wire netting or wire gauze and not of iron bars. The patents of this kind put in evidence were one to W. W. Hubbell, dated June

26th, 1841; one to E. May, dated July 28, 1857; one to J. L. Vauclain, dated Aug. 20, 1861; one to A. S. Sweet, Jr., dated June 23, 1863; one to J. Smith, dated Aug. 16, 1870; one to Weidman and others, dated Dec. 20, 1870, and one to J. Smith, dated March 7, 1871.

Vauclain's spark-arrester consisted of a perforated cylindrical box or screen, in which the perforations or apertures consisted of latitudinal (horizontal) slots, which, from the drawing, appear to be cut out of sheet iron. This slotted sheet iron constituted the cylindrical box or screen. This screen could not be said to be made of iron bars, which are the thing patented to the plaintiffs, 225 but it approaches very near to it. The slots and iron strips are also placed horizontally, whilst the plaintiffs' patent is for a grate with vertical bars.

Smith's last patent, dated March 7, 1871, about a month before that of the complainants, describes a spark-arrester consisting of a grated casing or tube made by a continuous bar or wrought iron coiled spirally in horizontal coils, or of cast-iron rings, one above the other, lying horizontally and strung to upright rods to keep them a proper distance apart, or, the patent says, "the grating may be made in any other desired manner, providing it presents rigid bars for the hard ignited cinders to strike against, and providing there are openings sufficient in number and size to permit the free escape of the lighter particles with the products of combustion." Now, this coiled wrought-iron bar and these cast-iron bars or rings approach very near to the invention patented to the plaintiffs, the only difference being that they are horizontally arranged, whilst the patent of the complainants require- the bars to be vertical. This would fairly raise the question whether the change was a patentable invention; but the complainants contend that their patent, though dated a month later than Smith's, is not anticipated by it, inasmuch as their application was sworn to Dec. 31st, 1870, and was filed in the Patent Office January 5th, 1871, two months before the date of Smith's patent. The time of filing of Smith's application is not shown.

226 The relative priority of inventions is determined, first, by the dates of the respective patents therefor, but this is not conclusive. Evidence outside of the patents may be given to prove priority. The date of the application, if it described the invention sufficiently, is conclusive evidence that the invention was made prior to such date. The complainants, therefore, have shown that their invention was made prior to the date of Smith's patent, and no evidence has been offered to show that Smith's invention was made prior to that time. The presumptions arising from the course of business in the Patent Office are not sufficiently certain and precise to countervail the effect of the complainants' evidence. We may, therefore, lay the last Smith patent out of view. Without it I do not see anything in the other patents relied on sufficient to justify me in holding that the invention claimed in the patent of the complainants was not patentable. Confining the patent to the terms of the claim, "the grating D with vertical bars," meaning,

according to the specification, "straight vertical bars of iron placed at small distances apart," I see nothing in any prior patent to prevent it from being a good and valid patent.

The defendants, however, have attacked it on the score of utility. They have endeavored to show by a series of experiments that a spark-arrester consisting of such a grate as that of the complainants has no superior utility or advantage over those of certain
227 other forms. The first question which presents itself when
such a defence is made is, "Then why did you use it?" This mode of attacking a patent can never succeed without showing by the clearest evidence that the invention claimed is utterly frivolous and worthless, and the fact that the defendants have used it and infringed the patent is always a strong *argumentum ad hominem* against them. I do not think that this defence is sustained.

The defendants further contend that the patent is to be restricted to cases in which the petticoat pipe E, which stands on the grate, is smaller at top than the smoke-stack or orifice underneath the same, so as to leave an annular space to be covered by the netting F. I have already adverted to this subject in considering the validity of the reissue. An examination of the latter will show that it is not restricted to cases of the kind referred to. The specification, it is true, calls the pipe E surmounting the grate a petticoat pipe, but that only refers to its shape—smaller at top than at the bottom—and it is probably thus referred to because it was a pipe in common use at the time. It is not said, as in the original patent, that "a space is left around the top of the pipe between the edges of the aperture in the top of the smoke-head and the pipe." Provision, however, is made for such open space, when it exists, by the netting F, which covers it. This may have been regarded as the common case, and hence was provided for; but it has nothing to do
228 with the essence of the patent. That, as I have said, consists
of a grating of vertical bars of iron, as applicable to one form of pipe as to another, and having no reference to the form. I do not think that the point is well taken. In my judgment, the first claim of the patent covers all spark-arresters coming within its description and used and applied in the smoke-head of a locomotive boiler, no matter what the form or dimensions of the pipe to which it is applied.

Lastly, the defendants deny that they have infringed the patent. Specimens of the grating which they have used and which are charged as as infringement have been exhibited to the court. They do not, it is true, consist of separate bars, unconnected with each other. But the patent does not say that the bars must be unconnected; on the contrary, the drawings show a connection running around the middle of the bars, as if it were a brace or stiffener to hold the bars at equal distances apart and to keep them more firmly in position. The defendant's grate consists of upright cast-iron bars, with connections between them at intervals, leaving long spaces or slots between the bars, and only interrupted by the connections, exactly like the spaces between the bars required by the patent. The imitation of the invention described in the patent is not exact, but it is substantial. The bars used are the equivalent of the bars described in the patent. I think it is an infringement. I refer, of course, to the grating used by the defendants, in which the bars were upright and the spaces between them were longitudinally conformable thereto.

The complainants are entitled to a decree for an injunction and an account of profits and damages in the usual form.

(Opinion.) Filed Sept. 30, 1887.

229 At a stated term of the United States circuit court for the district of New Jersey, held in the city of Trenton, N. J., at the Sept. term thereof, 1887, to wit, on the 30 day of September, 1887.

Present: Hon. Joseph P. Bradley, circuit justice.

FRANCIS KEARNEY and MARY F. TRONSON, Executrix, &c., *vs.* THE LEHIGH VALLEY RAILROAD COMPANY. } Decree.

This cause coming on to be heard upon the pleadings and proofs, whereupon the court doth find, order, adjudge, and decree—

That the patent named in the bill herein and granted to Francis Kearney and Luke F. Tronson, dated April 11, 1871, and numbered 113,528, and reissued December 10, 1872, and numbered 5184, is a good and valid patent, and that the defendant has infringed the first claim of the said patent as contained in the reissue numbered 5184.

And it is further ordered, adjudged, and decreed that it be referred to S. D. Oliphant, as master *pro hac vice*, to ascertain and state the account of the damages resulting to the complainants 230 from the infringement aforesaid, and also the gains, profits, and advantages which the defendant has realized from the use of the infringing instrument.

And it is further ordered, adjudged, and decreed that a perpetual injunction issue out of and under the seal of this court, directed to the said defendant, restraining and enjoining it, its attorneys, servants, agents, and workmen and all others acting under and with it, henceforth and forever from further infringing said letters patent.

And it is further ordered that the complainants recover of the defendant their costs, to be taxed.

JOSEPH P. BRADLEY,
Circuit Justice.

[Endorsed.] No. 19. U. S. circuit court, dist. of New Jersey. Kearney and Tronson *vs.* The Lehigh Valley R. R. Co. Decree. Copy.

231 United States Circuit Court, District of New Jersey.

FRANCIS KEARNEY and MARY F. TRONSON
vs.
THE LEHIGH VALLEY RAILROAD CO.

The taking of testimony in the above-stated cause on the part of the complainant- on accounting at the office of the Lehigh Valley Railroad Company, in Bethlehem, Pennsylvania, on Tuesday, the 7th day of February, A. D. 1888, before Hon. S. D. Oliphant, master.

Present: S. D. Oliphant, master; Elwood C. Harris, Esq., on the part of the complainant-; Andrew McCallum, Esq., on the part of the defendant.

It is agreed between the parties that the testimony in this case shall be taken by a stenographer and the signatures of the witnesses waived and the depositions to be read with the same force and effect as if taken in long-hand.

232 H. STANLEY GOODWIN, a witness produced on the part of the complainants, being duly sworn according to law, testified as follows:

Direct examination (by Mr. HARRIS):

Q. Where do you reside, and what is your present connection with the Lehigh Valley Railroad Company?

A. I reside in South Bethlehem, Pa., and am general superintendent of the Lehigh Valley Railroad Company.

Q. Of the company over its whole course?

A. The whole of the Lehigh Valley railroad.

Q. Between what points does the Lehigh Valley Railroad Company extend?

A. It extends—its main line—from Perth Amboy, New Jersey, to Pittston, Pa.

Q. Are there different divisions of the road?

A. Yes, sir.

Q. What are they?

A. They are the New Jersey division, the Lehigh division, and the Wyoming division, constituting the main line between Perth Amboy and Pittston. In addition to that there are the Mahanoy division, the Beaver Meadow division, and the Hazleton division, which are branches.

Q. How long have you been general superintendent?

233 A. About four years.

Q. Were you with the company previous to that date; and, if so, in what capacity?

A. I was assistant superintendent from 1866.

Q. Who was the general superintendent during that time?

A. Robert H. Sayre.

Q. Is he living?

A. Yes, sir; he is now second vice-president and lives in So. Bethlehem and has his office in this building.

Q. Where are the general offices of the railroad?

A. Here.

Q. And the record books, &c., of the company are kept here?

A. Some of them are and some are not. To what records do you refer? There are a great many different kinds of records kept. Do you mean the stock ledger?

Q. No, sir; I am not after the stock.

A. Some of the records are kept in Philadelphia.

Q. The records of the operating of the road?

A. They are kept here mainly.

Q. And of the motive power?

A. Some of the records of the motive power are kept here and some in the shop offices.

Q. Are there records of the building and repairing of your
234 locomotives?

A. Yes, sir.

Q. Where are they kept?

A. At the shops where the building and repairing is done.

Q. Has the Lehigh Valley Railroad Company built their own locomotives in years past; and, if so, for how long?

A. They have always built their own engines, to some extent, but not altogether. Most of our passenger engines we build at our own shops.

Q. At what point?

A. At all our different shops. We build the passenger engines at all our different shops, and some of our locomotives, but we don't do a great deal of building. The larger number of engines for our increase of stock have been purchased.

Q. Are the records of the date of purchase of these locomotives and also of the building of all your locomotives in the shops kept in the office of the company?

A. Yes, sir.

Q. When was the New Jersey division opened?

A. In May, '75.

Q. Is that the date of the building of the line from Easton to Perth Amboy?

A. That is the date when it was finished.

235 Q. Then there was no division known as the New Jersey
division previous to that time?

A. No, sir.

Q. Were any of your trains, locomotives, &c., run into New York before that time?

A. No, sir.

Q. Not operated by your company. You had no lease on any other track to New York?

A. No, sir; not until *b*e built the road.

Q. In what shops of the company, where located, have engines been built since 1872 or 1873?

A. At South Easton, at Wilkes Barre, at Hazleton, at Weatherly, and at Delano.

Q. Does the company at its shops do all the repairing of the engines?

A. Yes, sir; we do all the repairing of our own engines at our own shops.

Q. How about those which you have purchased; do you repair those at your own shops?

A. Yes, sir; we repair all of our engines at our own shops, whether purchased or built by us.

Q. In these records of the building and the repairing of engines at your shops do the building and repairing and the cost thereof appear?

236 A. Yes, sir.

Q. Are there records kept by the company of the running of each of your engines?

A. Yes, sir.

Q. Where are those records kept?

A. At the shops where the engines belong.

Q. Are there records kept of the coal consumed by your engines?

A. Please explain that a little, make it more definite. Do you mean how much each engine consumes?

Q. Yes, sir.

A. No, sir; we hav-n't any general record showing how much coal each engine consumes, not for all engines.

Q. Is the coal weighed when delivered to the engine, each engine?

A. No, sir; not usually.

Q. Have you ever kept such records as that?

A. Yes, sir; we have on particular occasions, when there was a special reason for it.

Q. But you do not keep a record of the coal used by each engine?

A. Not usually.

Q. Where are the records kept of the employés of the road—that is, the employees operating the trains on the road?

A. At different places where their time is kept the record is kept; some at one place and some at another.

237 Q. Not at the general office?

A. No, sir; we don't keep them at the general office.

Q. Where are such records of the New Jersey division kept?

A. At different places. If you mention what particular classes of employees you refer to I could tell you.

Q. The locomotive engineers?

A. Who run upon the New Jersey division?

Q. Yes, sir.

A. Their time is kept at the South Easton shop.

Q. Are the records there running back over 10 and 15 years?

A. Yes, sir; over the length of time that the New Jersey division is open.

Q. Since 1875?

A. Yes, sir.

Q. Before becoming assistant superintendent, in 1866, were you connected with the road?

A. No, sir.

Q. Are you familiar with the construction of locomotives?

A. Yes, sir; to some extent.

Q. Will you look at the figures on Defendant's Exhibit C? Do you know by what name that arrestor has been called on the road?

A. No, sir; I don't know that it has any particular name.

Q. The same as to Exhibit B?

238 A. I should say as to Exhibit C we called that the spark-arrestor with horizontal slots; Exhibit B, that we called spark-arrestor with vertical slots.

Q. By what name was it known usually on the road?

A. I don't know that it had any other name than that.

Q. Do you know how the use of that arrestor, Exhibit B, originated on the road?

A. I can't say positively, but my impression is that Mr. Kinsey saw one somewhere and took a pattern from it to make it, thinking that it was, perhaps, a little cheaper than the one which we had in use before, which was a wire netting.

Q. Do you know when that was?

A. No, sir.

Q. Look at Exhibit D. What arrestor is that?

A. That is the arrestor composed of wire netting.

Q. Do you know when that was first used by the company?

A. That, I should say, was used from immemorial and is now in use.

Q. Is that in general use at the present time on your engines?

A. I might say yes it is in general use, although we have some modern devices that are on some engines which are somewhat different, but that is the one in general use.

Q. Have you always used on the road a straight stack?

A. No, sir.

239 Q. What kind of a stack, then, has been in use?

A. In ancient times stacks of different construction, which flared and which had a space within them for collecting sparks.

Q. Where was the flare? Do you now refer to what is known as the diamond stack?

A No, sir. What we understand as the diamond stack is mainly a straight stack, but the stacks I referred to were flared stacks, such as were used in ancient times, namely, when wood was used as a fuel.

Q. Since the use of coal on your engines have you used mainly the straight stacks?

A. Yes, sir; since I have been connected with the road.

Q. That is, since 1866?

A. Yes, sir.

Q. Have you ever used on your locomotive what is called a cone and netting?

A. Yes, sir.

Q. What would you call the stack used with that?

A. Those were mainly the diamond stacks. This is the netting shown in Exhibit D.

Q. That is the netting at the foot of the stack—down in the smoke-arch?

240 A. Yes, sir.

Q. I refer to the netting up near the top of the stack and the cone—the inverted cone. Have you ever used locomotives with that attachment?

A. Yes, sir.

Q. To what extent?

A. That I am hardly prepared to say. Mr. Kinsey can tell you better than I can.

Q. How nearly can you give me the time when you used stacks with the cone and netting at the top?

A. I should say that in 1866, when I came here, that was the ordinary construction.

Q. That was the ordinary construction in 1866?

A. Yes, sir.

Q. Are you using them at all today?

A. Well, I would rather you would ask Mr. Kinsey that question. I would not like to be recorded on that.

Q. Do you know who suggested this Exhibit C with the horizontal slots?

A. I think Mr. Kinsey.

Q. Which has been in more general use, the horizontal slots or the vertical slots, according to your knowledge?

A. Why, I would say that when we commenced using the horizontal slots we discontinued the making of the vertical slots altogether. 241

Q. Do you know when that was?

A. I can't say.

Q. About how long ago?

A. I suppose four or five years ago.

Q. Before or since you became general superintendent?

A. Before.

Q. How long before?

A. Well, I think a year or two before.

Q. Has this arrester shown in Exhibit D, the wire netting, been in general use during years past?

A. Yes, sir.

Q. For how long?

A. Well, I should say three or four years.

Q. You think that it was in general use by the road to any extent before that time?

A. Oh, yes, sir; years ago it was in use generally.

Q. It was years ago?

A. Yes, sir.

Q. Then did it give way to something else?

A. The wire netting?

Q. Yes, sir.

A. It never has given way to anything.

242 Q. You said it had been in general use for some three or four years past?

A. Yes, sir.

Q. Was it before that time in general use?

A. Yes, sir.

Q. On what part of the road?

A. On all parts of the road.

Q. To what extent?

A. Well, almost universally on all engines that used spark-arrestors at all.

Q. Were the cone and wire-netting patterns discarded for the use of these arrestors at the foot of the downward extension of the stack pretty generally years ago?

A. Yes, sir.

Q. How nearly can you give the time when the cone and wire netting went out of use on your road?

A. I don't believe I can give the time with any accuracy.

Q. Were they in use to any extent when you opened the New Jersey division?

A. I think not.

Q. What is the officer termed that is at the head of your several shops at different places?

A. He is termed the general superintendent.

Q. Of the shops?

243 A No, sir; we have no other officers over the shops—you mean of each shop by itself?

Q. Yes, sir.

A. The master machinist or master mechanic.

Q. Who is the master mechanic at South Easton?

A. Mr. John I. Kinsey.

Q. And who at Wilkes Barre?

A. The Wilkes Barre shop is under the charge of Alexander Mitchell, who is the superintendent of the Wyoming division also.

Q. And at Hazleton?

A. Mr. David Clark is the master mechanic.

Q. And at Weatherly?

A. Mr. Philip Hofecker.

Q. And at Delano?

A. Mr. John Campbell.

Cross-examination (by Mr. McCallum):

Defendant's Counsel: I would like to explain to your honor that the issue here of infringement is upon that device, Defendant's Exhibit B. Those other exhibits, C & D, are not infringements, according to the opinion of the court.

Q. Do you know where that device, Exhibit B, was used and to what extent?

244 A. It was used on the engines which belong at the South Easton shops. I do not know the number of engines to which it was applied, but Mr. Kinsey has an accurate record; I think, somewhere about 86.

Q. Was it used anywhere else on the road?

A. No, sir; nowhere else on the road.

Redirect:

Q. You say on about 100 engines?

A. I think something like 100 engines.

Q. About how many engines are in use on the New Jersey division?

A. We run our engines over the New Jersey and Lehigh division jointly. There is no particular number of engines assigned especially to the New Jersey division. They all belong at the South Easton shops and are in charge of Mr. Kinsey.

Q. How many, about, at the present time are there at the South Easton shops or belong to the South Easton shops?

A. 150.

Q. Have you a record of the number at those shops in 1875 after the New Jersey division went into operation and each year down to 1886?

A. I find that the number of engines at the South Easton
245 shop each year on the 30th day of November is as follows:

1875	86
1876	97
1877	98
1878	100
1879	100
1880	103
1881	109
1882	124
1883	133
1886	150

Recross:

Q. You are quite sure there were none of these spark-arrestors with the vertical slots used in any other division?

A. Yes, sir; I am quite sure.

Q. And only on engines belonging to South Easton?

A. Yes, sir; only on engines belonging to South Easton.

Redirect:

Q. Do you know anything about Mr. Mitchel putting them on some engines at one time?

A. I have no recollection that he did; I think not.

John I. Kinsey, being duly sworn on the part of the complainant-, testified as follows:

Direct examination (by Mr. Harris):

246 Q. Where do you reside and what position do you hold on the Lehigh Valley Railroad Company, and how long have you held such position?

A. I reside at South Easton. I am master mechanic in the Lehigh Valley Railroad shops and have held that position nearly 32 years.

Q. Over what part of the road of the company are the engines used that have their headquarters at your shops?

A. From Mauch Chunk to Perth Amboy.

Q. How many locomotives were there at those shops in 1883?

A. I can't give you the exact number.

Q. Have you record of when the engines were built and where—all your engines?

A. Yes, sir.

Q. Where are those records?

A. At South Easton.

Q. Can you state at the present time what engines there were in that division in 1875, where built and when?

A. I can, at the shops.

Q. Do the records at your shops also contain the facts of repairs made on the engines from 1875 down, and back of that?

A. Yes, sir.

247 Q. On what engines and when and the cost?

A. Yes, sir.

Q. Do these records also contain accounts of what arrestors were used in each locomotive and when put in?

A. Yes, sir.

Q. Have you those records here?

A. Yes, sir; I have those records here.

Q. Just produce what you have in those records.

A. (Witness produced book.) This shows the different style of stacks, 1 to 4. This is a record of the condition of the smoke-stacks—the diamond, the straight, the cone and screen, and another style of stack. These are designated by numbers. We keep a record each day of the condition of the stack and all about it. Here is a copy of the daily sheet that we keep.

Q. Number 3 was what you call a cone and a screen?

A. Yes, sir; that was the cone and screen, but more commonly known as the diamond stack.

Q. How often are the screens examined?

A. Every day, as you see here. Every day they are examined, and we record the date and the time of the day.

Q. And those are the numbers of the locomotives?

A. Yes, sir.

Q. On which number as shown in this book were the
248 screens placed marked in Exhibit B?

A. On number 1.

Q. On any of the others?

A. No, sir.

Q. When does this book commence which you have produced?

A. In 1870.

Q. Did No. one at that time mean the same as shown in the diagram in the beginning of this book?

A. Yes, sir; engine No. 1 does not belong on the Lehigh division. That was used on another division to run down with the passenger trains to Easton.

Q. How far does this book you have produced extend in time?

A. From January 25th, 1870, to August 9th, 1870.

Q. From this book, what kind of stacks does it appear were mostly in use at that time?

A. No. 3.

Q. Almost entirely?

A. Yes, sir.

Q. That number is called what?

A. The diamond stack.

Q. With cone and netting near the top of the stack?

A. Yes, sir.

249 Q. How was that stack constructed?

A. Just as you see it there.

Q. What do these lines represent?

A. Iron.

Q. What kind of iron?

A. Sheet iron about No. 12, 14, 10.

Q. Then the stack shown in No. 3, known as the cone and netting, was made of sheet iron?

A. Heavy iron. I suppose you might say that it was about No. 10—somewhere along there.

Q. But of sheet iron, not of cast iron?

A. Sheet iron, wrought iron.

Mr. McCallum: I do not see that this testimony is relevent to the question before us at all. What have we got to do with the diamond stack? It has nothing to do with the issue at all. I think this examination, if your honor please, ought to be confined to the thing infringed.

Mr. Harris: What would you confine it to?

Mr. McCallum: I would confine it to stacks like this stack which the court decided to be an infringement. I do not see why you should travel over the whole art to get at this question.
250 I think it ought to be confined to the use of this thing, Complainant's Exhibit Grating.

Q. Then in 1870, as you have stated, the stack No. 3, consisting of the cone and grating, was, as appears by this book, almost universally used on the engines?

A. Yes, sir.

Q. Did that stack contain such a screen as is shown in either Defendant's Exhibit B, C, or D?

A. It contained a wire netting of the same material that is made of (referring to Ex. D).

Q. Where was that netting placed—as in Ex. D?

A. No, sir.

Q. Where?

A. In the upper part of the stack.

Q. At the top of the stack?

A. Not exactly at the top of the stack.

Q. How far from the top of the stack, about?

A. I guess it was a foot—15 or 18 inches.

Q. Was there any grating placed in the smoke-arch or netting?

A. No, sir.

Q. Then when coals were drawn through the tube there was nothing to arrest them until they came within 15 inches of the top of the stack?

251 A. No, sir.

Q. And until after they received the force of the exhaust?

A. No, sir.

The book witness referred to is known as "Record of Smoke-stacks and Spark-arrestors Examined at So. Easton Shops."

Q. Has a similar book been kept down to the present time?

A. Yes, sir.

Q. And you have it?

A. Yes, sir.

Q. But not here to-day?

A. They would fill this room full.

Q. About how frequently did you have to renew either the cone or the netting or the stack when using No. 3?

Objected to as immaterial. The question relates to a device that is not in issue—a device located at the top of the stack and entirely different from the one which we are now enquiring about—which is located at the bottom of the stack, and the invention that is said to be an infringement is a grating located in the smoke-box of particular form, having long vertical openings, and is distinct from other forms such as shown by Exhibits C & D.

252 Mr. Harris: It appears by the testimony of the books produced that at the time the witness is speaking of this was the form of locomotives principally in use. This was a device for securing the same ends, namely, the prevention of coal leaving the engine, as the infringement. It certainly seems to me that it is competent for the complainant, after a decree of infringement, to show what was in use by the company just immediately before this time and the advantages and disadvantages of using such device as compared with the infringing device. If we cannot do that, how are we to show profits?

Mr. McCallum: The opinion of the court sets forth the fact of similar devices, having openings at different places, being known before this invention, located at the bottom of the smoke-stack, and the only invention which is said to be infringed is the grating of a par-

ticular form located in that position where the same thing has been located before and shown by the exhibits in the case, which the court refers to, and therefore the comparison should be made be-
tween gratings of other forms located in the smoke-box and
253 not in the smoke-stack. These older devices were open to
the defendants to use without infringing the patent, and they had a right to use them; but this comparison that is now sought to be made is between a device that is not considered at all in the patent—that is not the invention which is covered by it—and I submit that the comparison is not a proper one. It is quite immaterial how often these gratings in the top of a stack were renewed.

The master stated that his practice has been to take the objections and the answers to the objections, and then the question and answer and let the whole thing go to the court together. The master does not rule.

A. I cannot answer that question, for I don't know.

Q. Will the record at your shops show how frequently any or all of these parts were renewed?

A. No, sir.

Q. Which, in your opinion, is the better form of arrestor, the netting with a cone at the top, as in No. 3, or a netting placed at the bottom, as in Ex. D?

A. We consider the netting at the bottom better than the netting
at the top.
254 Q. Why?
A. It arrests the sparks here, and we deposit them in a box, instead of carrying them to the top of the stack.

Q. What was the difficulty arising from their being carried to the top of the stack?

A. It was easier repaired, if any repairs were necessary—easier put in.

Q. At the bottom, you mean, than at the top?

A. Yes, sir.

Q. About what was the expense of renewing the netting at the top, as in Ex. 3?

A. I can't answer that question; I don't know.

Q. Can't you give us an idea of the expense, judging from the cost of the netting and the time you put it in?

A. No, sir; I haven't got it.

Q. Which is the more expensive to apply to a locomotive, wire netting, as in Ex. D, or the cast grating, as in Ex. B or C?

A. It is more expensive for the netting in Ex. D.

Q. About what is the expense of renewing a wire netting like Ex. D?

A. I cannot give you the cost of the total. The difference would be between the difference between the price of the netting and the
cost of the iron.
255 Q. Either could be applied at about the same.
A. No; the netting would cost a little more to put in. The netting costs more than the cast iron.

Q. How much more on a locomotive once put in?

Objected to, as defendant's counsel does not think the cost of material enters into this question. The invention is not of any particular metal, but for a form of grating with a particular opening in it. The patent is silent as to the particular kind of metal to be used, except that it is iron.

A. I cannot answer the question. I don't know exactly.

Q. About what do the castings for Ex. B or C weigh? I refer only to the grating.

A. About 85 pounds for a set; that is 6 pieces.

Q. It comes in six sections to make the circle?

A. 6 sections make a circle.

Q. And the whole weighs about what?

A. 58 pounds.

Q. About what are such castings worth?

A. 3½ and 4 cents per pound.

Q. Is the wire-netting arrestor such as is shown in Ex. D woven in that shape?

A. No; it is woven in flat sheets and then must be formed.

256 Q. Then you have to cut them and unite them?

A. Yes, sir.

Q. Can't you give us an estimate of the cost of the netting and the forming of an arrestor like Ex. D ready to be applied?

A. Well, I think it takes in the neighborhood of 13 square feet.

Counsel for defendant repeats his objection and asks that it be applied to all questions as to cost of material.

A. (Continuing:) 13 square feet of wire netting at 37 cents per sq. foot; that would be the difference between the cost of iron at 4 cents a pound and the wire netting in flat sheets. The labor is about the same, the putting together.

Q. The cast plates are in a shape to be put right together. They are so cast?

A. Yes, sir; they are cast segments.

Q. You don't have to bend them?

A. We cut the corners off in order to make the cone, and then bend them around, and then put bands around the top and bottom.

Q. In how many pieces is the wire netting cut to form one of those arrestors?

A. 2 pieces.

Q. Each one going half way around the circle?

A. Yes, sir.

257 Q. What are these nuts 3 on each side, right and left, shown in Exhibit D?

A. They bolt the two halves together.

Q. Those bolts pass through the mesh in each half and the nust on the outside?

A. Yes, sir.

Q. Have you the records for each locomotive using the arrestor shown in either B, C, or D, stating just when new gratings or nettings were put in?

A. I have the record of the vertical slots, but not of the others.

Q. Do these records of the vertical slots run through your books during the whole time you used it?

A. Yes, sir; the whole time we used the vertical slots.

Q. But you have no record of the other two forms?

A. No.

Q. Why were the records kept of the vertical-slot form and not of the horizontal-slot or netting form?

A. We have a record of all the stacks that have screens in but the vertical stacks—the No. 1 stacks—the number of vertical slots from the time we put them in until we discontinue using them.

Q. Were you using other slots—horizontal slots—at the same time?

A. No, sir.

258 Q. When did you first use an arrestor with horizontal slots like Ex. C?

A. We commenced using horizontal slots, Ex. C, in 1883.

Q. You hadn't used them before that time?

A. No, sir.

Q. Had you before that time used any arrestor made by cast segments in the same position as shown in these three exhibits, except the vertical slots?

A. No, sir.

Q. In this record book you have produced record of smoke-stacks and spark-arrestors examined at So. Easton; the particular arrestor is not stated in this book, except the kind used in No. 3, described as cone and screen?

A. Yes, sir; that is cone and screen.

Q. That seems to be the only kind that is mentioned here particularly?

A. Yes, sir.

Q. This does not seem to mention any kind of arrestor except that kind?

A. That is all, No. 3.

Q. Are the books like the one you have produced and following in the point of time the only records that you have showing the continuous good condition or bad condition of the screens?

259 A. Those are all.

Q. Then you have no record that will show at what date a new screen of any particular pattern was put in the locomotives?

A. (Referring to book before him.) It shows it here.

Q. Are there *are* any records of the matter of screens—their character, their condition—kept anywhere outside of your shops, so far as the same were applied to the locomotives at your shops?

A. No, sir; that is on the Lehigh and New Jersey divisions.

Q. When did you first use screens like Ex. B on your locomotives?

A. We put one set in in 1878.

Q. In one engine?

A. Yes, sir—that is, in one engine December, 1878.

Q. Was that the first you had used them?

A. Yes, sir; that was the first of that description.

Q. Had you any arrestor with vertical slots before that time?

A. No; I say no. We did try a patented stack or cone by McAllister that had a vertical slot in the top of the stack.

Q. But none down in the smoke-arch located where this is?

A. No, sir.

Q. Is the grating shown on Defendant's Exhibit A, called the blue print, same as Ex. B?

260 A. Yes, sir.

Q. When did you first use the grating similar to the blue print?

A. December, 1878.

Q. In how many locomotives have you used an arrestor similar to the blue print?

A. As near as I can tell, about 128; it might not have been quite so many, but there were not any more than that.

Q. About how many were in use in the beginning of 1883?

A. At the beginning of 1883 there were 113.

Q. Have you a number in use at any yearly dates beginning from 1878 down to 1883?

A. Yes, sir.

Q. You may give the numbers in such form as you have them.

A.—

1878	1
1879	64
1880	17
1881	14
1882	17

That brings us up to the beginning of 1883, the question that you asked.

Q. I understand you to say that there were 113 in use in 1883.

A. No, sir, you said the beginning of the year 1883.

Q. Are those that you have just given additional ones put
261 in; then in 1883 there were 15 equipped?

Mr. McCallum: That is the time they were equipped?

A. Yes, sir.

Q. Then you add those all together and that makes it?

A. Yes, sir.

Q. Then the number that you have just given us do not represent the total number in use in each of those years, but the number of different locomotives equipped?

A. It gives us the number that was equipped each year. They were not all equipped in 1879.

Q. But those numbers give each year the additional number equipped. Is that right?

A. Yes, sir.

Q. So that in 1883 there were equipped in all 128?

A. Yes, sir.

Q. The number you have just given represents the additional ones equipped each year?

A. Yes, sir.

Q. How many locomotives in the beginning of 1883 were there in your shops?

A. I can't tell you that.

Q. Then, beginning with 1878 and running up to 1883, these spark-arrestors with vertical slots were put in about all the
262 locomotives in your shops?

A. Very nearly all.

Q. What arrestor was in most general use at the time you first, in 1878, put on one with vertical slots?

A. Wire netting, the same as Ex. D.

Q. Had that been used for a number of years?

A. Yes, sir.

Q. Whose suggestion was it that you first used the grating with vertical slots?

A. It was a suggestion of my own, thinking that I could make it cheaper than the wire netting.

Q. You followed out that suggestion until you introduced it on most of the locomotives?

A. Yes, sir.

Q. Then was it a fact that it could be applied more cheaply than the wire netting?

A. It could, as I have explained it to you, with the difference in the cost of the netting and the bolts.

Q. When did you cease to use these arrestors with vertical slots?

A. In the spring of 1883.

Q. After the commencement of complainants' suit?

A. Yes, sir.

Q. To what then did you resort?

263 A. To the horizontal, same as shown in Exhibit C.

Q. What is generally being used now on the locomotives?

A. Wire netting, same as Exhibit D.

Q. How long did you use the horizontal slots, as shown in Ex. C?

A. We used the horizontal slots until 1886.

Q. Had you seen any spark-arrestor similar to Ex. B, with vertical slots, before the suggestion came to you to use it?

A. Nothing more than the punched sheets—that is, Smith's stack; that was all sheet iron.

Q. Where was that placed?

A. That was run right up to the top of the smoke-stack, or nearly so.

(Witness identifies Defendant's Exhibit Smith's Patent No. 106,515 as the device referred to.)

Q. Was Smith's patent owned by your company?

A. Not that I know of.

Q. Is it necessary in using coal on locomotives to have spark-arrestors?

A. Well, yes; I suppose it is.

Q. Why?

A. To retain the fire from setting fire to buildings along the track.

Q. Have you ever kept any continuous records as to the coal consumed by each locomotive?

264 A. Not, only on special occasions.

Q. It is the custom of some railroads to do that?

A. I believe there are some that do it.

Q. So that except in some special cases that you have mentioned you have no means of knowing whether the coal consumed by locomotives is more or less?

A. No, sir.

Q. You give them enough coal to do their work?

A. Yes, sir.

Q. From your general recollections, Mr. Kinsey, how nearly can you state how frequently you renewed the wire screen like Ex. D on a locomotive in ordinary use?

A. I can't tell; we put them in and they are in yet, in good condition.

(By Mr. McCallum:)

Q. State when they were put in.

A. They were put in in 1886.

Q. Are they still in good condition?

A. Yes, sir.

Further direct:

Q. Previous to 1886, had you put in such screens as are shown in Ex. D?

A. Yes, sir.

Q. Just in the same form?

A. Yes, sir; as near as may be; placed in the same posi-
265 tion they are there; they had no door on them; we have a
door on now; we find that it — necessary now—in the same
position and for the same purpose.

Q. In all those screens made previous to 1883, like Ex. D, were they made with doors?

A. Not all of them.

Q. Pretty generally?

A. Well, occasionally we put a door in, but not as a general thing.

Q. Well, the screens that you used previous to 1878 and until you replaced them generally with vertical netting were those wire screens, were they not?

A. Yes, sir; that is a question you asked me before.

Q. And they had to be renewed occasionally?

A. We didn't have to renew them, because we hadn't them long enough to wear them out.

Q. Previous to putting in the vertical netting?

A. Yes, sir.

Q. When did you first put in the wire screen like Ex. D?

A. In 1877.

Q. Then you only used those, or at least some of them, about a year before you began to replace them with vertical openings?

A. Yes, sir.

266 Q. What did you use previous to 1877?

A. The cone screen No. 3 of the record. We had several forms.

Q. But that screen was near the top of the stack?

A. Yes, sir.

Q. Then in 1877 you first used the screen down in the smoke-arch?

A. Yes, sir.

Q. I desire to ask you again a question asked a little while ago—whether or not the form of stacks shown in No. 3 in your book, with cone and netting at the top—was it not a form that soon cut out?

Objected to for the reasons before given.

Q. The cone would cut out by the coal striking against it.

Q. How about the netting?

A. We didn't have much trouble with the netting. It was the cone. It would crack, being of cast iron.

Q. How about the sides of the stack, about their cutting out?

A. Nothing more than any other ordinary stack would do, by constant pealing off and wasting away of the iron.

Q. The stack shown in No. 1, the form of stack in which netting or grating like Ex. B & C were used, were made of what?

A. Wrought iron.

Q. It was just a straight, smooth pipe?

267 A. Yes, sir

Q. There was nothing to stop coal after it passed through the arrester and started out?

A. No, sir.

Q. There was nothing to wear this stack out?

A. Just the same as other stacks, by getting wet and dry iron will depreciate; will rust off.

Q. These stacks are now made of cast iron?

A. No, sir.

Q. None of them?

A. None that we have.

Q. What would you say was the difference in cost of constructing a diamond stack like No. 3 and a straight stack like No. 1?

Objected to as immaterial.

A. I can't say what the difference is.

Q. Both have been down in your shops under your supervision?

A. Yes, sir.

Q. Frequently while they were in use?

A. Yes, sir.

Q. Can't you give us an idea?

A. I can't tell you a thing that I don't know. I don't know what it cost.

268 Q. Have you any one in your shops that can tell us that?
A. No, sir; because we never kept any particular account of those stacks.

Q. Have you any man that can tell us the difference in the time in constructing those two stacks?

Objected to on the ground heretofore stated.

A. Not without going to work to make one and keeping a special account of it.
Q. The stack in No. 1 is made of wrought iron, you say?
A. Wrought iron.
Q. It is like a stove pipe?
A. Yes, sir.
Q. Brought around and riveted together?
A. Yes, sir.
Q. Just one flat piece of iron curved in that shape, apart from the ornamentations from the outside?
A. Yes, sir; there are two cases of it, a cover on the outside.
Q. The stack shown in No. 3 was also made of wrought iron?
A. Yes, sir.

Counsel for defendants states that he would reserve his right to object to all this line of testimony.

Q. Just describe how that was constructed. I have made
269 a sketch like those in your book, Nos. 1 & 3, and I offer the same in evidence, to be used in explanation of the witnesses' testimony.

Same was marked "S. D. O." The offer is objected to as immaterial.

Q. The stack of No. 3 was of wrought iron?
A. Yes, sir.
Q. And in how many sections, from the top of the boiler A to the top of the stack E?
A. 4 sections.
Q. How were those sections joined at the point B C & D?
A. With rivets.
Q. Then there was very much more work in constructing such a stack than the stack of No. 1?
A. There was more labor.

77

Q. Was the stack used in 1887, with the netting like Ex. D, and the stack used with the grating, Ex. B & C, the same form?
A. Yes, sir.
Q. And that was a straight stack, like No. 1?
A. Not exactly like No. 1, but similar to it.
Q. The inside opening was simply a straight opening from the top of the smoke-arch?
A. Yes, sir.
270 Q. And from the top of the smoke-arch down to the top of the arrestor was simply an open tube, like the smoke-stack?

A. Flared out.

Q. It extended down the same size with the smoke-stack, except a little ways above the arrestor it was flared?

A. Yes, sir.

Q. Like Ex. A, the blue print?

A. Similar to that; there is the difference in the stack.

Q. Then the difference you have spoken of in the stack is shown in blue print by an outward light line, which is ornamentation?

A. It is the outside casing.

Q. And does it answer any purpose except ornamentation?

A. No, sir.

Q. The steam and smoke does not come in contact with the outside casing at all?

A. No, sir.

Q. It passes through the inside casing?

A. Yes, sir.

Q. Can't you give us an idea in the difference of the cost in constructing the straight stack and the diamond stack? I do not now refer to the ornamentation on the outside, but simply the inside stack.

A. No, sir; I cannot give you the cost, because I don't know.

271 Counsel for defendant renews his objection to all questions relating to the stacks and the cost of their construction.

Q. Have you with you, in connection with a number of arrestors put on each year having vertical openings, the names or numbers upon which the same were placed?

A. No, sir; I cannot give you that.

Q. After you put arrestors on locomotives having the vertical openings, beginning with 1878, were any taken out and others substituted before the beginning of this suit?

A. No, sir.

Q. You never were a locomotive engineer?

A. I ran a locomotive, but never followed it as a business.

Q. Since you have been running into Jersey City are any of your locomotives laid up there over night?

A. Yes, sir.

Q. About how many each night?

A. Well, I suppose there are about 3 to 5.

Q. Do they go to the shops on the Meadows or lie in Jersey City?

A. Yes, sir; some lie in Jersey City and some at the Cove.

Q. Is there a man to take care of those locomotives through the night when they are laid up there?

A. Yes, sir; at Jersey City.

272 Q. Whose business it is to attend to that?

A. Yes, sir.

Q. Do you know who was in your employ in such capacity as that at that end of the route in '82?

A. No; I had a man by the name of Brash and one by the name of Schlegel. I cannot tell you the years in which they were changed.

Q. Are these men still in your employ?

A. One of them.

Q. Which one?

A. Schlegel.

Q. What became of Mr. Brash?

A. He has gone to California.

Q. Where is Mr. Schelgel now employed?

A. At Jersey City.

Q. At the same place?

A. Yes, sir.

Q. Were there any other men that were temporarily with engines over night? If engines went to the Meadows and stayed over night, would one of those men from Jersey City go with it?

A. No, sir.

Q. Would there be any special man there?

A. No, sir; the Penna. railroad would generally look after them there.

Q. Are you sure about the year in which you say you first
273 used these arrestors being 1878?

A. Yes, sir.

Q. What book does the record which you have given the number put in come from?

A. From my foundry book, in which the account of castings are kept.

Q. Do you know how often these were renewed from 1878 to 1883?

A. No, sir.

Q. Is there an account of that?

A. The only account I have is the number of screens we made during that time.

Q. Then might some of these numbers which you have given be renewals upon the same engine?

A. Yes, sir—that is, the number of screens, you mean, that I have an account of.

Q. Where you gave us the total 128.

A. I have a number of screens that we made, from the time we first made them up to 1883. I have the number of screens, the number of pieces, which would show the total number of engines that were equipped and renewals.

Q. Then, if on a number of locomotives that were renewed they would not have been on as many as 128 different locomotives?

A. I take it, as near as I can tell of the engines that had
274 that No. 1 stack on, there might be less than that, but there
was no more.

Q. That is, there was no more than 128, or no more than 128 sets of castings?

A. Yes; we made more than 128 sets of castings.

Q. But there were no more than 128 engines?

A. No, sir.

Q. Have you any means of knowing how many sets of castings you made?

A. Yes, sir.

Q. How many?

A. (Referring to paper): I made 1,081 pieces of castings, and it takes six pieces to make one arrestor.

Q. That makes 180 sets with one segment over?

A. Yes, sir.

Q. If one segment was broken, it would not be necessary to renew the whole, would it?

A. No, sir.

Q. But only that segment?

A. Yes, sir.

Q. If a wire-netting arrestor like Ex. D gave out in any part you had to put it in entirely new?

A. No, sir.

275 Q. How much of it?

A. That would depend altogether upon how much was damaged. You could cut out a piece and put in another piece.

Q. How could you join a new piece onto the old?

A. Just the same as we fastened it together, with bolts and rivets.

Q. If at a certain point where two wires crossed at one corner of the netting both wires had been broken by something, could you put a patch over that point?

A. Not if it was to any great extent—that is, if the whole thing was burned out. We have had no occasion to renew it from the fact that they were not burned out.

Q. You used them for so short a time?

A. Yes, sir.

Q. Then you really took these out to substitute the vertical grating while they were still in good condition in 1878 and after that time?

A. Yes, sir.

Q. Who is the foreman in charge of your shops where this part of the work on an engine is done?

A. The boiler-maker would be the foreman of that shop.

Q. And who is that?

276 A. That would be John Clark.

Q. Has he been foreman for a number of years?

A. Yes, sir.

Q. Since back to 1875 or 1876?

A. Yes, sir.

Q. Was this arrestor, Complainants' Exhibit Defendant's Grating, with vertical slots ever called Mr. Mitchel's?

A. Not that I know of.

Q. In 1877, when you commenced putting — wire screens like Ex. D, did you change the stacks on all your locomotives?

A. We changed them on all that had that screen put on.

Q. Do you know on how many locomotives you placed the screen, Ex. D?

A. No, sir.

Q. Have you anything that shows?

A. No, sir.

Q. Does the book like this show upon examination?

A. Not what kind of a screen that is in there.

Q. I understand that after the cone and netting you first started the introduction of the screens like Ex. D in 1877?

A. Yes, sir; it would show that the straight stack was put on when the screen, Ex. D, was put in.

Q. You didn't want a diamond stack any longer, then?

277 A. No, sir.

Q. Were there some locomotives that you changed directly from a diamond stack with cone and netting to a straight stack with vertical-slot grating?

A. Yes, sir.

Q. Have you any means of knowing just how many locomotives you put the wire in in 1877?

A. I could not tell you.

Q. When you put on that one grating with vertical slots in 1878 how long, according to your recollection, did you run that locomotive before beginning to put it in other engines?

A. Not a great while; I can't tell the exact time, only as you see by the statements.

Q. Have you the cost, apart from the material, of making arrestors like Ex. B, C, & D?

A. Yes, sir. I shall have to dissect it, because some of the labor goes in both. I can give the cost of both kinds—that is, of the wire netting as well as the screen. That part and this part are both the same.

Q. So the attachment on the top and bottom are the same in each?

A. Yes, sir. I can give you the total cost of each.

Q. You can give us the items of the cost of each. The items that make up the total cost—you may take the cost of the arrestor.

278 A. The cost of Exhibit D—that is, the wire netting—is $5.49; Exhibit B is $2.87.

Defendant's counsel again objects to the cost of material.

Q. You have on the paper from which you have read this estimate different items which make up this cost?

A. Yes, sir.

Q. Whence did you obtain these items?

A. By going to work and making one of each kind and keeping an accurate account of it.

Q. When did you do that?

A. Within the last 3 weeks; I can't tell the exact time.

Q. The prices for material and labor that make up these two amounts are the usual prices paid at the present time?

A. Yes, sir; just the actual cost.

Q. How does the cost of material at the present time compare with the material in 1878?

A. I cannot tell you that, but in the same proportion what it would have cost to make one then of the wire netting and the cast iron. It would be in about the same proportion.

Q. Did you have this work done for the purpose of using it and testifying in this suit?

A. Yes, sir.

279 Q. Was the cost of rivets, bolts, and other articles manufactured of iron as high in 1878 as it is at the present time?

A. I had so many things to think of in that time that I could not say.

Q. Do you manufacture all the rivets, bolts, bands, and other articles mentioned in this schedule?

A. You say rivets; rivets we buy, but the rest of the articles we make. Of course, we buy the iron and form it into shape.

Q. Rivets you buy; do you know what the price of rivets was per pound in 1878?

A. No, sir.

Q. Do you know what the difference per foot of wire screens was between the present time and 1878?

A. No, sir; I do not.

Q. Do you know what you were paying your men in 1878 compared with 1888?

A. No, sir; I do not recollect.

Q. Were wages higher then than they are now?

A. I don't recollect that.

Q. Have you anywhere on your time books or material books or other records what it actually did cost in the years 1877 and 1878 and following that time actually to make and apply these arrestors?

A. No, sir.

280 Q. I would like you either to make a copy of this or let these items which you have testified to go into the record—at least part of it.

A. (The paper referred to was offered in evidence and marked "Complainants' Exhibit Kinsey's Statement of Cost.")

Q. In making up the time, &c., on this estimate did you make a number of each kind or only one?

A. Only one of each kind.

Q. Would there be an advantage in making a number at the same time?

A. Probably; if you would buy a lot of material——

Q. I more particularly refer to the labor—the hours that you have marked here as put in?

A. No; I don't know that there would be any difference in the cost of the labor.

Q. I see you have put in the 6 segments of screen, 54 pounds at 3½ cents per pound. Is that what it cost you?

A. I said 3½ or 4 cents per pound. I put that in at that which I thought was a reasonable price for them.

Q. Then in this estimate you make the casting that is spoken of, but you don't weave the wire screen?

A. No, sir.

Q. That you have to buy at the price you put there—27 cents?

281 Q. Will you give me the designation of that wire screen?

A. 3½ to the inch and No. 13 wire.

Q. It is wire screen, 3½ to the inch, No. 13 wire; that is something that is positive, definite?

A. Yes, sir.

Q. Do you know whether there was ever a patent covering a wire screen similar to that which you put in in 1877, Ex. D?

A. No, sir.

Q. Was there ever one covering horizontal slots like Ex. C?

A. I never knew of any.

Witness having been shown patents, one being of a wire-gauze screen dated July 28th, 1857, and another having horizontal bars, dated August 20th, 1861, and also one with screens, J. Smith, March 7th, 1871, says:

I only know of them by having been shown them now.

Q. Then the patent shown you—J. Smith, March 7th, 1871—shows a wire netting surrounding the exhaust pipe and extending up into the smoke-stack, does it not?

A. Yes, sir.

Q. The Lehigh Valley Railroad Company have never had any interest in that patent of Mr. Smith's, have they?

A. Not to my knowledge.

282 Q. In that patent the sparks are arrested by wire gauze placed in the smoke-arch?

A. Yes, sir.

Q. Or by a grating with horizontal openings?

A. Yes, sir.

Q. Will your books at the S. Easton shops show the wages paid to your men and cost of materials in previous years?

A. Yes, sir.

Q. In April, 1883, or in 1883, when you took out these arrestors with vertical slots, what was their condition generally?

A. They were fit for use, as they were taken out because it was claimed they were an infringement.

Cross-examination (by Mr. McCallum):

Q. You have mentioned a foundry book as in your possession. Does that book show all the castings of which the screen- like Ex. B were made and used?

A. Yes, sir.

Q. Will you produce the book and explain to the master how the entries referred to are found?

A. (Witness did so.)

Q. Have you made an abstract from the book showing all the screens entered therein as being of this description?

A. Yes, sir.

283 Witness produced an abstract from the books, and the same was offered in evidence and marked "Recapitulation from foundry book."

Q. Did you purchase screens from anybody else or did you make them all at your foundaries?

A. We made them all—that is, the screens you refer to?

Q. Yes, sir.

A. We made them all.

Q. Then all that were used from the time you began to use them, in 1878, until you took them off, in 1883, are 1,081 pieces, or about equal to about 180 and $\frac{1}{6}$th sets?

A. Yes, sir.

Q. You have stated that the wire-netting screens like Ex. D cost more than the cast screens like Ex. B. How is it as to the wearing or lasting capacity of these two different screens?

A. I can't tell, as we have not used them long enough yet to determine it.

Q. From the experience which you have had can you form any opinion?

A. I should judge they would last twice as long as the cast iron.

Q. In your opinion, has the Lehigh Valley road obtained any advantage from the use of the cast-metal screens like Ex. B?

284 A. No, sir.

Q. Please give your reasons for that opinion.

A. The openings are too large and allow too much fire to escape.

Q. The openings in what?

A. In the cast-iron screen. You mean the advantage of the cast-iron screen over the wire netting?

Q. Have they derived any advantage from this screen?

A. No, sir. The advantage of using that, so far as the spark-arrester is concerned—it will allow more fire to escape than the wire netting.

Q. That is not an advantage, is it?

A. No, sir.

Q. Suppose you were using this wire netting, and then you used that—have you obtained any advantage by using the wire screen?

A. It was a little cheaper to put it in.

Q. Is that all?

A. Yes, sir.

Q. If your opinion is correct as to the wire-gauze screen lasting twice as long as the cast-metal screen, is there any advantage of saving any cost by the use of the cast-metal or infringing screen?

A. No, sir.

285 Q. You have stated, I think, that your only reason for adopting that cast-metal or infringing screen was that you could make it cheaper than the netting?

A. Yes, sir.

Q. Then, if I understand you right, you now find that you made a mistake, and that the wire netting is the cheapest in the end?

A. Yes, sir.

Q. Why did you give up the casting and resume the use of the wire netting.

A. Because the Pennsylvania Company would not allow us to run on their road with the cast-iron screen on it, on account of it throwing too much fire.

(By the MASTER:)

Q. By the cast-iron screen you mean the infringing screen?

A. Yes, sir.

Further cross:

Q. The Penna. R. R. would not permit you to run your engines over their road with screens made of cast metal?

A. Yes, sir; with vertical slots.

Q. How would it be with lateral slots like Ex. C?

A. The same thing. They made the same objection.

Q. Have you anything to show the construction of the screen you are now using?

286 A. Yes, sir. (Witness produced blue-print drawing:) This represents the screen here. That represents the material that the screen is made of. That is the full-sized wire mesh, the same as the exhibit we have here, which is a sample sent from the Penna. road as to what we should use. Then the sparks were carried down through an apparatus in the smoke-head into a box below the footboard back of the cow-catcher; then it has a slide at the bottom, where the sparks are dropped out.

Q. Have you a specimen of the wire gauze or netting of which the screen now in use is made?

A. Yes, sir.

(Witness also produced a specimen of the wire gauze of which the netting shown is made.)

Counsel offered in evidence the blue print referred to, and the same was marked "Blue-print spark-arrestor now used."

Also offered in evidence specimen of netting of which grating is made, and the same was marked "Defendant's Exhibit Wire Netting."

Q. So far as the grating is concerned, is that which you now use the same as you used in 1877, before you commenced to use the cast-metal grating?

A. It is as near as I can tell.

Q. When did you first learn of the Kearney & Tronson patent?

287 A. In the early part of 1883, I think.

Q. How was it brought to your notice?

A. Well, I don't know that I can tell. I think Mr. Goodwin notified me of it.

Q. Was it after the suit was commenced?
A. I can't recollect that.
Q. You took out the grating because of the suit, didn't you?
A. The vertical grating; yes, sir.
Q. As soon as you learned that there was a claim of infringing a patent you discontinued their use?
A. Yes, sir.
Q. And hav'n't used any since?
A. No, sir.

Defendant's counsel reserved the right of putting Mr. Kinsey on the stand for the defense.

Q. When did you commence running your locomotives on the Penna. road?
A. 1875, I think it was.
Q. When did you get orders from the Penna. railroad to use this wire netting that you have just testified to?
A. April 20th, 1886. It is marked on the specimen.
Q. Then from 1875 until 1886 your engines were run on their road without objection with such arrestors as you used?
288 A. Yes, sir; we had different kinds on then.
Q. Such as you have been testifying to?
A. Allow me to ask for an explanation; the same as represented in this book?
Q. What I mean is that no objections were made by the Penna. road to the using of gratings until 1886?
A. No, sir; because we only used them a very short time.
Q. Then at the time the Penna. railroad, in 1886, directed that you should use a wire screen with a certain mesh you were using a cast screen with horizontal bars?
A. Yes, sir.
Q. And had been using it since the early part of 1883?
A. Yes, sir.
Q. Had they then just recently found fault with your engine for throwing fire?
A. I don't know whether that was the first *instant* of complaint or not.
Q. At least it had not operated to discontinue the use of your grating until that time?
A. No, sir; then they ordered the wire netting.
Q. That you should put that on if you run over their road?
A. Yes, sir; we must conform to their standard.
Q. Do you know how long that had been the standard on their road?
289 A. No, sir.
Q. The Pennsylvania road are not using an arrestor put in in the form you put yours in now?
A. No, sir; they have an extended smoke-arch, but with a wire netting.
Q. But not a circular netting?
A. No, sir.

Q. Have you as yet used continuously the wire screen for half the length of time that you have used the cast grating?

A. Yes; I think we have.

Q. On how many locomotives?

A. I can't tell you that.

Q. In replacing segments of a cast grating, do you have to make new all the parts that were mentioned in this Exhibit "Kinsey Statement of Cost"?

A. Not necessarily.

Q. Those are for simply fastening the casting to your locomotive?

A. Yes, sir—that is, the different parts.

Q. Iron for bands, rivets?

A. Yes, sir.

Q. Drilling lugs and bands; those I see are clamped together by bolts?

A. Yes, sir.

290 Q. So you simply loosen that and put in new castings?

A. Yes, sir.

Q. Then it is very little trouble or expense to put in new castings if any break?

A. Not a great deal.

At this point the examination adjourned until Wednesday, the 8th day of February, 1888, at the shops of the company, at South Easton, Pa.

291 United States Circuit Court, District of New Jersey.

FRANCIS KEARNEY *et al.*
vs.
THE LEHIGH VALLEY RAILROAD COMPANY.

Master's session held at the office of Knight & Knight, #800 Broad street, Newark, N. J., on Wednesday, December 19th, 1888.

Present: S. D. Oliphant, Esq., the master before whom the accounting is had; Mr. Elwood C. Harris, counsel for the compl'ts; Mr. Andrew McCallum, counsel on behalf of the defendants.

The testimony is taken in shorthand, subject to the agreement heretofore appearing of record.

REUBEN VAN HORN, a witness produced on behalf of the complainants, being duly sworn according to law, testified as follows:

292 Direct examination (by Mr. HARRIS):

Q. Where do you reside and what is your employment?

A. I reside at Perth Amboy, and my employment is to keep fires in locomotives in the round-house, and also water.

Q. On the Lehigh Valley railroad, is it not?

A. Yes, sir.

Q. How long have you been in that employment?

A. About 13 years.

Q. And at Perth Amboy?

A. Yes, sir.

Q. Is that ever since the road has been opened to Perth Amboy?

A. No, sir; shortly afterwards.

Q. Are there many of the locomotives of the company cared for at this round-house each day?

A. Well, they differ; it just depends on the amount of coal they move. Sometimes there are four or five, sometimes there are eight or ten, lying there waiting for their turns to go out.

Q. In your duties as named by you at the round-house do you know the construction of the locomotives generally and of the appliances they use for the purpose of arres- sparks and coal?

A. Well, I have seen them. That is about all I know.

293 Q. What is in general use at the present time on the locomotives?

A. In the arresting of sparks?

Q. Yes.

A. Wire netting principally.

Q. And where is this wire netting placed?

A. Around the exhaust.

Q. And in the smoke-arch of the locomotive?

A. Yes, sir.

Q. For about how long has this wire-netting arrester been in general use?

A. That I could not say, how long. It is something that I have not kept my mind on to keep recollection of anything of the kind.

Q. Could you estimate—one year or ten years?

A. Yes; I could do that. It may have been—well, to the best of my knowledge, some six or seven years.

Q. (Witness, being shown Complainants' Exhibit Defendant's Grating, is asked:) Do you remember when such a grating was used on the locomotives?

A. They have been used.

Q. Are they used at the present time?

A. Not to my knowledge.

294 Q. Do you remember that they were all taken off some years ago?

A. They took them off a few years ago, but the length of time I could not positively say.

Q. At the time of taking off this grating with vertical slots, were there gratings put on with horizontal slots?

A. I believe there was some.

Q. There were some?

A. Yes, sir.

Q. And are those gratings with horizontal slots still used?

A. Not to my knowledge.

Q. Those have given way, then, to the wire netting placed in about the same position as those gratings formerly occupied?

A. Yes, sir.

Q. Does a locomotive in its running and steaming draw live coals from the furnace through the flues?

A. Yes, sir.

Q. To a considerable extent?

A. Some more than others, according to the way they run.

Q. Do you mean according to the force of their steaming?

A. The force of their exhaust.

Q. These live coals that are drawn through are not entirely cinders—that is, coal with everything burned up—but live coal?

295 A. Live coals.

Q. The purpose of an arrester is to prevent these live coals from being thrown out and causing fire; that is the object of an arrester?

A. Yes, sir.

Q. Are the companies particular or not that an arrester should be in such order that live coals of any kind cannot be thrown out?

A. Very particular.

Q. Do these live coals when drawn in the smoke-arch of a locomotive cause considerable heat there?

A. Yes, sir: they do.

Q. Do they really burn there?

A. They do burn into a cinder.

Q. Do you know whether this burning in front will heat the sides of the locomotive, or whatever iron the burning coal comes in contact with, very hot?

A. Yes, sir.

Q. To what heat?

A. To red hot. I have seen the front end red hot.

Q. Then the effect would be, so far as the mass of coals is concerned, to make the front end like a furnace almost?

A. Yes, sir.

296 Q. Is any appliance used at the present time on your locomotives to draw these coals out of the smoke-arch and prevent their burning there?

A. There is.

Q. (Witness, being shown Defendant's Exhibit Blue-print Spark-arrester, S. D. O., m'r, February 7th, 1888, is asked:) Does this drawing represent the appliance now in use for the purpose last stated?

A. I believe it does, as near as I can see it.

Q. Then this appliance, as you understand it, effects the purpose of drawing the hot coals out of the smoke-arch as fast as they drop in there and depositing them in the box which has no air or draft around it?

A. Yes, sir.

Q. This is a late appliance which the company has adopted, is it not?

A. I believe it is.

Q. About how long, according to your recollection, have they had this on their engines?

A. I could not positively say how long.

Q. During the time they have been introducing these wire nettings?

A. Yes, sir.

297 Q. Do you think they had it on before introducing the wire nettings in there?

A. No, sir; I do not think they had. I am positive they had not the box underneath the pilot that they have at the present time.

Q. You mean until about the time they commenced using the wire netting in place of the iron grating?

A. Yes, sir.

Q. Before this box was used the coals lodged in here and, of course, filled it up until you took them out?

A. Yes, sir.

Q. Was it part of your duty to take them out or have them taken out at the round-house?

A. No, sir; I had nothing at all to do with it. I have seen the firemen clean them out.

Q. The firemen did that?

A. Yes, sir.

Q. When they would come in?

A. Come in or go out.

Q. How far have you seen this arch filled up with the cinders?

A. Well, to the best of my knowledge, some as high as 12 or 14 inches.

298 Q. Would that reach up, then, to the bottom of the spark-arrester?

A. No, sir.

Q. But it would be up some 12 or 14 inches?

A. Some, to the best of my knowledge, about that. I never had any interest in it and do not know that I am exact.

Q. That is the way in which the engines were cleaned out during the time they were using those gratings, was it not?

A. Yes, sir.

Q. Of course, if the engine was run longer without clearing out it would simply fill on up?

A. Fill on up; yes, sir.

Q. As fast as the coals came through?

A. Yes, sir.

Q. The purpose of the present plan of drawing the coals out into the recepticle shown on this blue print is to prevent burning coals from staying in the smoke-arch?

A. Yes, sir.

Q. So that at the present time the engine does not become heated at that part as it did before?

A. No, sir.

Q. Or the iron and surroundings inside?

A. No, sir.

299 Q. (Showing witness piece of wire netting:) Is this piece

of netting I show you about the same kind of netting which is now used to make the arrester of?

A. I think it is about the size, as near as I can judge.

Q. Where is this appliance put on locomotives, at your roundhouse, or only at the shop at Easton and the other shops?

A. At the shop at South Easton.

Q. Were you in the employ of the company in any situation previous to the time you have been at Perth Amboy?

A. No, sir.

Q. When you first went to Perth Amboy, was the company using in its locomotives this cast grating or the diamond stack, cone, and netting?

A. The diamond stack.

Q. Cone and netting?

A. Yes, sir.

Counsel for the defendant objects to the whole of the testimony of this witness as irrelevant and immaterial to the issue.

Cross-examination (*de bene esse*) by Mr. McCallum:

Q. Have you ever had charge of a locomotive while running?

A. I have run some little; but very little.

Q. What?

300 A. A little while I ran; not a great length of time.

Q. When was that?

A. About the time the road was open; when I first began working for the company.

Q. That was about 1875?

A. Yes, sir.

Q. What kind of a spark-arrester was on the engine you ran?

A. They had the diamond stack.

Q. Have you ever run a locomotive provided with a spark-arrester located in the smoke-arch?

A. No, sir.

Q. Have you ever run a locomotive having a spark-arrester made of wire gauze located in the smoke-arch?

A. I do not think; I think the only engine I ran for the Valley Company was a diamond-stack engine; I only ran a few days, and then I took charge of the round-house.

Q. Then all the testimony you have given respecting the use of these spark-arresters located in the smoke-arch is not from any experience you have had, is it?

A. Not from running; no, sir; all I have seen I have seen them there.

Q. You say you have seen them "there." You mean in the roundhouse?

A. Yes, sir.

301 Q. Then you do not know of your own personal knowledge anything about them, do you?

A. No, sir.

Q. Excepting what you have seen in the round-house. Is that correct?

A. Yes, sir; that is correct.

Q. You have stated that the smoke-arch becomes heated with fine sparks, amounting almost to a furnace. How do you know that?

A. I have seen it from the iron that is heated.

Q. From the appearance?

A. The appearance of the iron; yes, sir.

Q. By the appearance of the engine when it came in?

A. Of the smoke-box being heated.

Q. By the appearance of the iron of the smoke-box?

A. Yes, sir.

Q. That has led you to believe that it had been heated?

A. Yes, sir.

Q. Was this true of the diamond smoke-stack as well as the others?

A. In regard to heating?

Q. Yes.

302 A. I do not actually know. It has been so long since I have run an engine of that kind or run any engine that I could not say any more, whether it is the same or not.

Q. Is it true of engines that were provided with spark-arresters like the exhibit, the cast-iron grating?

A. The heating?

Q. Yes.

A. Yes, sir.

Q. Would the heating be as great with those as with the netting?

A. The netting, when everything is right—that is, the wire netting; there is no heating there; it is all kept clear.

Q. That is, when the cinders are drawn off?

A. Yes, sir.

Q. But when the cinders are retained in the box is there any difference between the wire netting and the casting in regard to the heat?

A. No, sir.

Q. Have you seen the engines come in with the smoke-box heated to a red heat?

A. Yes, sir.

Q. That was before provision was made for drawing off the cinders?

A. Yes, sir.

Q. Have any of the engines that come into your round-house got what is known as the extended smoke-box?

303 A. There was one engine ran there with the extended front.

Q. Did you examine the smoke-box inside of it to see how the spark-arrester was fixed?

A. No, sir; I did not.

Q. You have nothing to do yourself with the cleaning out of the smoke-box, have you?

A. No, sir.

Q. And you never ran a locomotive with a spark-arrester of this description—that is, with the spark-arrester located in the smoke-arch?

A. No, sir.

Q. And all you know is what you have seen?

A. That is all I know about it.

Q. From a personal observation of the locomotives?

A. Yes.

OWEN HALL, a witness called on behalf of the complainants, being duly sworn according to law, testified as follows:

Direct examination (by Mr. HARRIS):

Q. Where do you live and what is your present employment and about how long have you been in your present employment?

A. I live in South Easton; I am employed as a locomotive engineer on the Lehigh Valley railroad.

304 Q. How long, is the question.

A. Going on ten years.

Q. About ten years?

A. Yes, sir.

Q. And running on what division?

A. I have been running on the Lehigh division on the first part of my running, and I was transferred on the Jersey division for the last nine years.

Q. For the last nine years?

A. Pretty nearly nine years. It will be nine years next June or May.

Q. Then your headquarters, or rather your stopping point, during all that time has been South Easton?

A. Yes, sir.

Q. Running either the one way or the other?

A. Yes, sir.

Q. And you are still a locomotive engineer, running between Easton and Jersey City?

A. Yes, sir.

Q. You are familiar with the devices that have been used on the locomotives you have used during this time for arresting sparks, are you not?

A. Yes, sir.

305 Q. (Witness, being shown Complainants' Exhibit Defendant's Grating, is asked:) Was such an arrester used upon a locomotive run by you during the past ten years?

A. Not in the beginning, but the one—I had a diamond stack and the cone with a net on.

Q. And then when that gave way what was put in?

A. Well, my recollection is we used this (referring to exhibit) for awhile.

Q. And then when this grate with vertical openings was taken out was there a cast grate with horizontal openings put on your engine?

A. Yes, sir.

Q. Can you state about how long ago the vertical grating was taken out and the horizontal grating put in?

A. No; I cannot recollect now how long it was.

Q. Do you know whether at that time a general change was made on other locomotives besides yours?

A. You mean on our division?

Q. Yes.

A. Not at that time; not to my knowledge.

By Mr. McCallum:

Q. You do not know?

A. When we got through with the horizontal then they made a change to the wire netting.

306 Further direct:

Q. From the horizontal to the wire netting?

A. Yes, sir.

Q. Then during your experience as a locomotive engineer with this company the diamond stack with cone and netting was taken out and a vertical grating put in; then the vertical grating was taken out and a horizontal grating put in, and afterwards the horizontal grate taken out and the wire netting put in?

A. Yes, sir.

Q. And wire netting is used at the present time on your locomotives?

A. Yes, sir.

Q. About how long has it been in use?

A. That I could not recollect any more, the different times. I could not recollect how long I had it on my engine.

Q. Do you know whether in Jersey City, near where your locomotives are kept, there are a lot of old gratings like this Exhibit Defendant's Grating?

A. Not to my knowledge. They might be there, but I do not remember seeing them.

Q. In the running and steaming of a locomotive does or not the exhaust draw live coals off the furnace and through the flues?

307 A. Into the smoke-box.

Q. To a considerable extent?

A. Well, I don't know; it depends on what coal we have got.

Q. These coals that are drawn through into the smoke-arch are live coals, right off the fire, are they not?

A. Well, not all.

Q. Before the present appliance was put on the locomotives for the purpose of drawing the cinders and coals out of the smoke-arch into the box below, these coals remained in the smoke-arch, did they not?

A. Well, when we had—well, they remained there and sometimes they filled up.

Q. Would they burn in there and make it hot?

A. Sometimes—sometimes they would get air from the front door of the engine and they would burn.

Q. Would they burn by reason of the draft coming through the flues when you were steaming?

A. It was by reason of the draft; sometimes the door did not fit tight on the front end of an engine.

Q. These coals that were in there were unburned coal—coal that was not consumed, was it not?

A. Yes, sir.

Q. And before this appliance was put on to draw them out, how did you get them out of the smoke-arch?

308 A. We had to shovel them out.

Q. Open the front door—the front end?

A. Yes, sir.

Q. And that was the work of whom on each engine?

A. The fireman, and sometimes I shoveled it out; it was not an every-day occurrence.

Q. The appliance used at present, and which is shown in the blue print referred to by the last witness, is in use on about all your locomotives in this division, is it not?

A. Yes, sir.

Q. And the purpose of this spark-box is to draw whatever cinders or coal——

A. From the smoke-box into the spark-box. There is a little nozzle which throws a jet of steam in that direction and pulls the cinders from the smoke-box and throws them into the spark-box.

Q. Is there not a pipe extending from the top of the spark-box in an opening near the exhaust which tends to create a vacuum in there?

A. Yes, sir.

Q. So that the purpose of this appliance is simply to get the coals and cinders out of the smoke-arch?

A. Yes, sir.

309 Q. And keep it clean?

A. Yes, sir.

Q. Has this spark-box been in use during the whole ten years that you have been on the road?

A. No, sir; not to my knowing.

Q. Was it put on the locomotives, so far as you know, about the time they commenced using this wire netting instead of a grating?

A. Yes, sir.

Q. Did you run your locomotives with a wire netting and without this spark-box at any time before it was put on?

A. That I cannot recollect.

Q. But, as you just stated, as near as you can recollect, they were put on about the same time?

A. Yes, sir.

Q. The location in the smoke-arch has been about the same as to height with the two kinds of casting and with the netting, has it not?

A. They stand about the same, I think; but it seems to me the wire netting is a little longer in the length of it.

Counsel for the complainant objects to the testimony of this witness as wholly irrelevant and immaterial to the issue.

310 Cross-examination (*de bene esse*, by Mr. McCallum):

Q. You have stated that sometimes a spark of unconsumed fuel in the smoke-arch will burn, and, if I understand you aright, they burn when air is admitted into the smoke-arch through some imperfection in the fitting. Do those sparks ignite and burn if the smoke-arch is perfectly fitted, so that no air can get in there excepting what comes through the flues and goes out by the exhaust?

A. If it gets through it will burn from the front end. If it gets air from the front door it will burn, or in some other way air gets in there.

Q. But suppose no air enters the smoke-arch from the front or in any way excepting through the flues, do the sparks then burn in the smoke-arch?

A. Well, I don't know. The exhaust ought to kill that fire. I do not know myself how that thing works. The draft from the flue ought to kill that fire from the smoke-box.

Q. You mean that the exhaust makes a vacuum in the box?

A. Yes, sir.

Q. Which should put out any fire if there is no air admitted?

A. Yes, sir.

311 Q. About how often have you noticed the smoke-arch in your engine heated or red hot from the burning of the sparks in the smoke-arch?

A. I never saw it red hot on my engine, to my recollection.

Q. Do you mean to say that during the ten years you have run locomotives you never had the smoke-arch red hot?

A. No, sir; not to my knowings.

Q. It would not likely be red hot without your knowing it, would it?

A. Well, I am under oath, and it might have got hot when I did not see it, but it did not show anything on the front door. If it got hot it ought to show something that was red hot. The smoke-arch is generally painted, and it would surely burn the paint off when it does get hot.

Q. Did it ever burn the paint off?

A. It did not burn the paint off; it would kind of peel it off in time; not in one day—once a week; that generally does on every engine. They generally get it painted once a week, and that will last another week.

Q. But you never saw the sheet iron made red hot?

A. No, sir.

312 Q. As far as heating is concerned, does it make any difference whether you use what is called the diamond stack or whether you use the screene with a vertical opening like Complainants' Exhibit Defendant's Grating or whether you used the

one with the lat*t*eral or horizontal openings or whether you used the wire-net screen*e* like Exhibit D—so far as the heating is concerned, does it make any difference which you use?

A. I do not think it does.

Q. Did you have a cinder-box, shown by the blue print "Defendant's Exhibit Blue-print Spark-arrester," on the engine when you used the grating with the horizontal slots?

A. Not to my knowledge.

Q. Was there a difference, so far as the heating of the smoke-arch is concerned, when you used the screen with the horizontal slots?

A. Not to my knowing.

Q. You did not have the cinder-box when either of these screens were used?

A. I cannot recollect.

Q. Can you say positively that you did not use the wire-netting screen shown by Exhibit D without the cinder-box?

A. That I cannot say.

Q. Look at the three exhibits, B, C, and D. (Witness did so.) Do you think it would make any difference, so far as the heating
of the cinders in the smoke-arch is concerned, which one of
313 the three was used?

A. Well, I could not say as to the most heat; I could not recollect about that.

Q. But you know as a fact that there was no difference between the screens, Exhibits C & B, in that respect?

A. Well, I never paid much attention between the two in regard to the heating. With this here (Exhibit B) we had more trouble than with this one (Exhibit C).

Q. What do you mean by more trouble? Please explain.

A. The screen (Exhibit B) stopping up and the front part of it filling up in the smoke-head.

Q. Do you mean the holes filling up?

A. No, sir; the bottom filling up.

Q. The screen, Exhibit C, did not fill up as much as Exhibit B?

A. No, sir.

Q. Have you examined a locomotive having what is known as the extended smoke-box?

A. No, sir.

Q. You do not know anything about it?

A. No, sir.

Q. In your experience which is the best spark-arrester of the three?

A. The wire netting, in my experience.

314 Redirect examination:

Q. Then I judge from one of your answers, near the close of your examination, that the vertical grating retains more cinders on the same run than the horizontal grating?

A. Yes, sir; that is my experience.

Q. And of course less cinders are thrown by the locomotive?

A. Which do you mean?

Q. If there are more retained in the smoke-head, then less go out?

A. That would depend on what coal we get, too.

Q. Then it is a fact that when you were using the vertical grating without any cinder-box it would fill up along the side of the grating if you did not clear it out often enough?

A. Yes, sir.

Q. Is it not true that the coals which are drawn into the smoke-arch are in the main red-hot coals when they are first drawn in?

A. That I could not say.

Q. They must necessarily come off of the top of the fire, must they not? They cannot come from the underneath very well.

A. They must come somewheres.

A. Out of the fire?

315 A. Yes, sir.

Q. They come directly from the fire, do they not?

A. They come directly through the flues.

Q. They come from the fire and go through the flues, do they not?

A. Well, I don't know.

Q. The draft through the flues when the engine is steaming or there is a strong exhaust keeps the flues clear, does it not?

A. Yes, sir.

Q. That is, the flame, &c., sweeps through the flues and keeps them clear, so that the coals go right through into the smoke-arch.

Objected to as leading.

Q. Is that true or not?

A. Well, I am under oath and I cannot say.

Q. The mode of arresting sparks is different in a diamond stack from that in either of the three arresters shown by Exhibits B, C, and D?

A. Yes, sir. In the diamond stack?

Q. Yes.

A. Yes, sir.

Q. Entirely different?

A. Yes, sir.

316 Q. There is nothing in the diamond stack to stop the coal or cinders which goes through the flues—no netting or grating—until it gets way up to the top of the stack, nearly?

A. Yes, sir.

Q. And after it passes the exhaust?

A. Yes, sir.

Q. Is it your experience that after a certain run there will be as great a quantity of coal and cinders in the bottom of the smoke-arch with a diamond stack as with one of these gratings at the bottom?

A. No, sir; not in my experience.

Q. The force of the exhaust driving the coals up there breaks them up and they get out very much, don't they?

A. Yes, sir.

Q. In the old times, when you were running a diamond stack, was there ever much coal to clean out of the bottom?

A. No, sir; nothing at all; not to my knowing.

Q. Then, if the heat in the locomotive smoke-arch is due to air getting in there and burning the coal there, if there are no coals there, there is no heat, much, to speak of, is there?

A. No.

317 Q. So that is it possible with a locomotive with a diamond stack to have hot coals stopped down in the bottom?

A. Not to my knowledge.

Q. Was the striking of these cinders in the diamond stack against the netting at the top of the stack hard on the netting?

A. The sparks struck the cone.

Q. And were turned off to one side?

A. No, sir; it was not hard on the screen.

Q. Do you know whether those screens frequently required repairs?

A. Not to my knowledge. They lasted a long time.

Q. They were examined in the shop and put in order and you simply ran the locomotive?

A. Yes, sir.

Q. Were the company particular that the arrest*re*, whatever it was, should be in perfect order?

A. Yes, sir.

Q. Were the engineers cautioned of the danger to property if they threw fire?

A. Yes, sir.

Q. Were the particles of coal which got through the netting in a diamond stack shot straight up or would they go out obliquely?

A. They would go out different ways in a diamond stack.

318 Q. With the straight stack that they are using at the present day, they go out in all directions?

A. No, sir.

Q. How do they go?

A. They drop more straight and fine.

Q. Straight up?

A. Yes, sir.

Q. And finer?

A. And finer, and the sparks are out before they come down.

Q. Was the same size of the netting used in the cone and netting diamond stack as is now used in the bottom of the locomotive?

A. I don't know.

Recross-examination (by Mr. McCallum):

Q. You have stated that the sparks that come out of the smoke-stack now—that is, when you use the spark-arrester in the smoke-arch—are finer than they were when you used the diamond stack?

A. Yes, sir.

Q. And generally go out before they fall; is that correct?

A. Yes, sir.

Q. Have you observed carefully this effect or result? Have you given this careful attention?

A. Who, me?

319 Q. Yes.

A. No, sir. In regard to what?

Q. Watching the sparks go out.

A. Yes, sir.

Q. You have stated that you find the wire gauze to answer the best of the three arresters shown by Exhibits B, C, and D. Does the wire netting make finer sparks than the other forms of grating?

A. I could not say what is the difference, but the wire netting throws a more finer spark than the others.

Q. You have observed that. Do you say that the wire gauze throws finer sparks than the others?

A. They do the way they work now. I do not know whether it is because of the wire or what it is, but since they made the change the wire netting throws the finer spark.

Q. Then that is your experience, that the wire netting like Exhibit D throws a finer spark than either of the gratings like Exhibits B and C?

A. Yes, sir.

Q. Did you notice any difference in this respect between the gratings with vertical and horizontal openings?

A. I cannot recollect now.

Q. Do the sparks get broken up into finer particles by
320 striking against the screen or do you know anything about
that?

A. I do not know.

Q. Do those fine sparks which you refer to as coming out of the straight stack where the wire gauze is used ever do any damage on your engine?

A. Not to my knowledge.

Q. Then you do not care how many of the sparks or fine particles of fuel are thrown out of the smoke-arch so long as they are so small or fine and do not do any damage?

A. I could not say that—with a straight stack?

Q. Yes; is it any object to you whether you keep them in the box or throw them out, so long as they do not do any damage?

A. We have tried to do all we can to keep them in the spark-box.

Q. Supposing you did not have any spark-box, would there be any object in keeping the sparks in the smoke-arch if they were made so fine that they would not do any damage when they — out of the stack?

A. They might fill up and keep the engine from steaming.

Q. They would be an objection to you. You would rather get rid of them than have them, because they interfere with the draft if they are there?

321 A. Yes, sir.

Q. You said that a screen with vertical slots, like Exhibit B, filled up more than one with horizontal slots, like Exhibit C?

A. Yes, sir.

Q. Were the sparks which came out of the stack with Exhibit C—the horizontal one—any larger or more dangerous than those which came out of the stack when you used a grating like Exhibit B with a vertical opening

A. I could not say any more.

Q. You found no difference, as far as that is concerned?

A. Well, I could not say. I never took so much notice, and if I did I forgot it; it is a good while, and I did not look at them, either.

Q. Did you observe the effect of those two screens sufficiently to form any opinion of which you liked best or which did the best work?

A. The horizontal one—the best of those two.

Q. You found the horizontal screen like Exhibit C better than the vertical one shown by Exhibit B?

A. Yes, sir.

Q. In what respects did you find the horizontal screen better than the other?

322 A. The horizontal one did not work the fire so hard and did not stop up so much, and the engine steamed more freely with the horizontal than with the other—with B.

Further redirect:

Q. In the use of those three arresters, Defendant's Exhibits B, C, and D, do you think there was more liability to set fire with one than with the other?

A. Well, the wire—Exhibit D—is better than any of them, as far as the sparks are concerned.

Q. Did you ever set fire to buildings or anything with any of them with your locomotives?

A. Not of my knowings.

Q. Do you think that the difference you have mentioned in reference to the wire nettings is due to the fact that no live cinders are retained in the smoke-arch, but are drawn off in the smoke-box?

A. Yes, sir; they are all drawn down in the smoke-box.

Q. They do not stay there to be drawn up or to stop up; they do not stay in the smoke-box either to be drawn up or to stop up the screen?

A. Unless something was wrong.

Further cross-examination:

Q. I do not know whether I asked you before if you ever used a screen like Exhibit D without a cinder-box?

323 A. I cannot recollect any more whether we used the box at the same time as we used that screen or not; I cannot recollect.

Q. Supposing you had used it without the cinder-box, the same as you would use the cast-metal screens without the cinder-box, would there still, in your opinion, be a decided advantage in using the wire screen over the other?

A. Yes, sir; the wire screen.

William Osborne, a witness produced on behalf of the complainant-, being duly sworn, testified as follows:

Direct examination (by Mr. Harris):

Q. Where do you live, what is your employment, and how long have you been in your present employment?

A. I live in Hoboken, N. J. My employment is engine-dispatcher at Hoboken for the D., L. & W. R. R., Morris & Essex division. I have been in Hoboken 10 years and three months. I was formerly at Phillipsburg in the same capacity.

Q. Have you ever been a locomotive engineer?

A. Yes, sir.

Q. And ran a locomotive for some years?

A. Yes, sir; I ran a locomotive on the Morris & Essex division for 18 years.

324 Q. Are you thoroughly familiar with the working of a locomotive?

A. Yes, sir.

Q. What spark-arrester is generally in use on the locomotives that are under your inspection at the present time?

A. Cast-iron cone and netting with a diamond stack.

Q. You have seen in years past the locomotives of the Lehigh Valley railroad?

A. Yes, sir.

Q. When you were at Easton?

A. Yes, sir.

Q. Do you remember whether they ever used the diamond stack and netting?

A. They used the diamond stack at the time I was at the upper end of the M. & E. division—most of the engines that came over into our yard. They used to come over daily.

Q. Do you know whether the construction of the diamond stack, cone, and netting used by them at that time was substantially the same as the construction of those used by the D., L. & W. at the present time?

A. My recollection of them is that they were the same.

Q. The time that you speak of now when you saw those stacks on the Lehigh Valley railroad locomotives is just previous to
325 the time you left Easton?

A. Oh, no; I saw them—I was in Easton 12 years, and I saw them from the time I went there till the time I left; they were still using them generally.

Q. They were using them on your locomotives at the time you left?

A. Yes, sir; that is, the locomotives that came into Easton.

Q. (Showing witness photograph.) What kind of a stack is that?

A. Diamond stack.

Q. Why is it of this diamond shape at the top?

A. In order to contract the cinder or whatever fire might come out, so that it will not spread so much. With the large opening it will spread all over the country.

Q. The netting in such a stack, for the purpose of stopping cinders and coals from being thrown out, is placed across the large part of the stack, is it not?

A. Yes, sir; that is what we call the centre—placed right across the centre.

Q. How is it applied to such a stack?

A. How is it applied?

Q. The netting part?

A. Oh, the netting part; that top part of the stack is put
326 on and the netting is placed there in the centre, and the two
parts are bolted together, having the netting between those two parts.

Q. In its largest circumference?

A. Yes, sir.

Q. About what is the diameter of the circular piece of net that is put in?

A. Well, the circular piece of net that is put in there is some 30 or 36 inches, I think. That is my recollection of it. They vary in size according to size of the cylinder part of the stack. Some use smaller cylinder parts than others.

Q. In the testimony which we have already taken the size of that large diameter was given as 40 inches. That will take a little larger piece than you have stated?

A. Yes, sir.

Q. Is the netting used for the purpose of a screen in that stack similar to the exhibit which I now show you, marked Defendant's Exhibit Wire Netting?

A. Yes, sir; they generally use a quarter-inch mesh.

Q. And a netting with about that size wire?

A. Yes, sir; steel wire, we use.

Q. And that is the style of netting that was used years ago in the diamond stack and is still used on your road?

327 A. Yes, sir.

Q. Then, if it is 40 inches in diameter at the top, you would have to cut a circular piece out of a woven sheet of this netting, would you not, to put in?

A. That is the netting which is put in right across the stack.

Q. But I mean it would take a piece large enough to cut a circle out of?

A. Yes, sir.

Q. Then each netting which you put in would take about how many square feet, considering that you have to throw away the corners? It would take a piece 40 inches square to make one, cutting the corners off, would it not, if the diameter in the large part was 40 inches?

A. Well, it would take about 12 feet to make each one.

Q. What is the cone made of?

A. Cast iron. That is an inverted cone.

Q. Not when put in?

A. Yes, sir; three sections to it.

Q. And made for the purpose of spreading these coals so they will not all strike——

A. It is made for another purpose—to break these cinders up when they strike it, so that when they reach the netting they are very fine.

328 Q. The tendency of the cone and the screen is to break these coals up, so that when they go out they will not be large enough to do any harm?

A. Yes, sir.

Q. In a locomotive with a diamond stack, when steaming, are the small cinders which are thrown out thrown straight in the air or obliquely?

A. Oh, no; at different angles.

Q. Does the locomotive with a diamond stack, cone, and screen collect many coals in the smoke-arch?

A. No, sir.

Q. They are mostly broken up?

A. There are very few left in the arch.

Q. How do you account for that? There are many coals drawn through flues, are there not?

A. Yes, sir.

Q. And you account for their not being left there by their going beyond the force of the exhaust and driving out?

A. The force of the exhaust takes them up.

Q. Have you seen locomotives since you have been connected with the D., L. & W. road, some few of them, that have used screens to stop the coals down below, have you not?

A. Yes, sir.

329 Q. Was that a grating called the Kearney & Tronson grating?

A. I saw two of those used—all that I know about.

Q. Did they stop the coal down at the bottom so that they had to be cleaned out?

A. Yes, sir; they arrested the cinders down in the arch.

Q. Is the grating marked Complainants' Exhibit No. 5 a section of the grating like the one that you used to see?

A. That is a section like we used.

Q. On those two locomotives that came under your notice?

A. Yes, sir.

Q. And this grating stopped the coal down in the bottom of the smoke-arch, so that there would be quite a mass of coal there?

A. Well, yes; it was quite a mass there, but not enough to go to the top of the grating.

Q. They would clear them out, would they not, at times?

A. They were cleared out about once a day.

Q. If an arrester is used which stops these coals down in the smoke-arch before they get into the lifting pipe, does it stop hot coals? Are the coals hot that come in there?

A. When they come through the flues they are hot.

Q. Right from the furnace?

330 A. Right from the furnace.

Q. And are they coals that are pretty well consumed or coals not consumed to cinders at all?

A. That depends on the quality of coal you are burning. If you are burning soft coal it is pretty well burned up; if you are using hard coal and the fire takes hold of it and cracks it up right away, there is a portion goes through unburned.

Q. With your experience with these engines having an arrester at the bottom, did these coals that were drawn there burn in that place?

A. If the air gets onto them. They do not if no air strikes them.

Q. Will the flame, &c., that comes in from the furnace cause them to burn?

A. No, sir; it will have no effect on them.

Q. They do not burn there?

A. They burn there when the smoke gets into the smoke-arch—in leaky joints or cracks of the smoke-arch.

Q. When they are drawn through there they are red-hot coals, are they not?

A. Well, we suppose they are; of course they are not visible.

Q. Does the front end of the locomotive—the smoke-arch—
331 become hot when it is steaming?

A. It becomes hot, but not — to burn unless the air gets in so as to keep those coals constantly burning.

Q. But whenever the air gets in it will make a fire of those coals there as hot as a furnace, will it not?

A. Yes, sir.

Q. What would be the effect of such hot coals upon a wire netting such as Defendant's Exhibit Wire Netting, their coming in contact with it and burning?

A. Well, there is a certain wear on it. It would wear in three months' time, probably, in portions of the netting.

A. No; I am speaking of it at the bottom and the red-hot coals coming against this netting.

A. It would warp it all up.

Q. How long would such a netting last where red-hot coal came right against it?

A. That would be owing to the service of the engine.

Q. What would be the comparison between red-hot coals coming — contact with the wire netting like I have shown you and with a cast grating like defendant's grating shown you?

A. Well, that grating with the red-hot coals lying constantly around it would burn out after a certain time.

332 Q. How about the wire netting?

A. The wire netting would burn out, but it would warp first; become very much warped.

Q. Will the wire netting stand the red-hot coal anywhere nearly as long as a cast-iron grate?

A. I do not think it will.

Q. Now, as to the wire netting in a diamond stack. How fast do those nettings cut out with the ordinary use of a locomotive?

A. Well, with the ordinary use of a locomotive they will cut out in about three months so that they will need patching—patching or renewing.

Q. They are sometimes patched a number of times before they are renewed?

A. Well, not with road engines; with yard engines sometimes they are patched.

Q. Were they formerly patched on your road more than at present?

A. Yes, sir; we used to patch them quite frequently on the upper end of the road.

Q. What is the result if there is a hole in this netting in use on a locomotive?

A. The fire will come out in larger pieces and larger volume.

Q. What does that do?

333 A. That will set anything on fire that is——

Q. Along the road?

A. All along the road anywheres.

Q. Then, from your knowledge of the matter, you would have to renew—put in a new wire netting in those diamond stacks every three months, on an average?

A. About three months was the average; but understand me now: that is for engines doing road service—heavy road service; for yard service they do not require it so much.

Q. What makes it necessary to renew them so often?

A. To keep the fire in, so that it does not go out in such a large volume.

Q. When it is necessary to put in a new netting what is done with the locomotive; how long does it take, about; how many men?

A. Well, you take three men and generally they will put in one in about an hour and hoist the stack back—take the stack off the engine, take it apart, put the wire in the stack, and put it right back again.

Q. Is the fact that this wire netting cuts out so readily one of constant danger of loss to the company by reason of setting fire to buildings?

A. Yes, sir.

334 *A*. Of course a breakage in the netting occurs when the engine is out on the road?

A. Yes, sir.

Q. And at work?

A. Yes, sir.

Q. And there is great danger of doing damage by firing buildings before it gets back?

A. Yes, sir.

Q. The wear on the sides of a diamond stack—how long will a stack usually run?

A. They will run from twelve to fifteen months before there is any wear; some will run longer before they begin to show any defects on the top of the stack.

Q. Then you have to renew the stack itself, as I understand you?

A. Well, portions of it sometimes wear. We don't always have to renew fully.

Q. But portions of it?

A. Yes, sir.

Q. Does the straight part below the diamond shape cut out like it does in the diamond part?

A. Well, the straight part will last longer than the diamond part.

Q. If no coal, excepting the little cinders which could go
335 through this cast grating with vertical openings or the wire
net, went out of a straight stack, there would be but little wear on the stack?

A. Of course, there would be less wear on the stack.

Q. Do you know about the cost of the netting and the labor each time you put in a new netting?

A. No, sir; I do not. All those accounts are kept by the main office.

Q. And the men who do such work earn about what wages a day of ten hours?

A. Well, their wages—men working on that kind of work get from $1.50 to $2.50 a day.

Q. Do you know the price of the netting which is used?

A. No, sir.

Q. I suppose you don't know what the cost of building a diamond stack is, do you?

A. No, sir.

Counsel for the defendant objects to the whole of the testimony of this witness which relates to the diamond stack as irrelevant and immaterial to the issue.

Cross-examination (*de bene esse*) by Mr. McCallum:

Q. Have you used any other kind of spark-arrester than the diamond stack on the D., L. & W.?

A. Yes, sir.

336 Q. What have you used?

A. We have used the grating called the Kearney arrester.

Q. You used the two that you refer to?

A. Yes, sir.

Q. Did you ever use wire-gauze netting in a smoke-arch?

A. Not until recently.

Q. What kind of wire netting have you used recently in that way?

A. We used a wire netting of a quarter an inch mesh in an extended smoke-arch.

Q. I understand in the extended smoke-arch the netting is first put diagonally across between the opening of the exhaust nozzle and the flue?

A. It reaches up over the top row of flues and extends out to the top of the smoke-arch door.

Q. The exhaust nozzle projecting through?

A. Yes, sir.

Q. How long have you used this extended smoke-arch spark-arrester?

A. I think it is about three months since those engines came there. They were new engines. It does not exceed four months.

Q. Have you had them long enough to make any comparison with the diamond stack?

337 A. We have no good results from those extended arches; the engines won't steam.

Q. Did you have the Kearny and Tronson cast-iron spark-arresters long enough to make a comparison with a diamond stack?

A. Well, my experience with them was very limited; only about between three or four months. The engines steamed very well with it.

Q. You had them about the same length of time you have had the extended smoke-box?

A. Yes, sir; but I wish to say that that was on the end of the road that I was on at the time; they were used on the lower end of the road longer.

Q. Well, as far as your observation goes?

A. Yes, sir.

Q. Did you have them on the engine which you ran at any time?

A. No, sir; I have not been a locomotive engineer for about twenty-two years; I was taken off a locomotive and put in the round-house as dispatcher.

Q. How do you know they steamed as well?

A. By riding out over the road with them at different times, and from reports which the men gave me.

Q. Do you know why they were taken off?

A. I do not; there were three of them sent to me, and after they were used up no more came.

338 Q. In your opinion, would a cast-metal grate like the screen Exhibit Defendant's Grating stand heat better than the wire screen like Defendant's Exhibit Wire Netting?

A. Yes, sir; the cast iron will stand the heat the best.

Q. In your opinion, would the wire netting burn up quicker than the wire grating?

A. Yes, sir.

Q. In your opinion, would the cast-metal grating stand wear from friction of cinders better than the wire netting?

A. Yes, sir.

Q. Have you any reason for your opinion other than the brief experience you have had and the observations you made?

A. My opinion is that the cast-iron would stand the wear the best.

Q. I am asking you if you have any other reason for your opinion than the experience which you have had with those cast-iron gratings?

A. Well, the netting which we used at the time that grating was used—we used at one time a freight stack with a cast-iron grating on top, and that ran two or three years without any renewing.

Q. That was on the top of the stack?

A. Yes, sir.

Q. But you have no experience or knowledge respecting the use of a cast-iron grating in the smoke-arch of a locomo-
339 tive other than your observation of the two Kearny and Tronson screens which were in use on the locomotives of the D., L. & W. for about three months, as you before stated, have you?

A. No, sir.

Q. You have no doubt that such cast-iron gratings will burn out if subject to the usual wear of a smoke-box?

A. I have no doubt of it—that they will wear out.

Q. And if they wear or burn out would not the danger be as great as when a break occurs in the wire netting of the diamond stack referred to in your examination-in-chief?

A. Well, the danger is quite as great with one as the other, if there is any defect in it, of throwing the fire.

Q. In your opinion, would not a screen located in a smoke-arch, whether made of cast iron or made of mall*i*-ble iron or of wire netting, be more liable to burn out than a screen located near the top of a stack such as the diamond stack?

A. Why, certainly.

Q. How about wearing out from friction with the particles of unconsumed carbon?

A. The friction would not be as great on them in the smoke-arch as it is in the top of the stack.

Q. Why not?

340 A. Cinders going through the flue up into the stack go with that momentum that it causes more wear on the netting. When they come into the smoke-arch and strike that casting or a netting the momentum is not sufficient to wear it as fast as it would in the top of the stack.

Q. Do you mean to be understood as stating that the momentum of the sparks is greater above the exhaust nozzle than below?

A. Yes, sir.

Q. And, so believing, you think the wear would be greater on a screen on the top of a stack than on one within the smoke-box?

A. Yes, sir.

Q. Do you think there is any appreciable wear on the screens when located in the smoke-box, through friction from the cinders?

A. That is owing to how those screens are placed.

Q. That hardly answers the question.

A. Yes; there is where the screen is placed above the exhaust pipes.

Q. Is there, in your opinion, when the exhaust pipe goes through the screen and project- above?

A. If the exhaust pipes go through the screen and that screen runs from the top of the flues to the top of the smoke-box door, there is appreciable wear on it.

341 Q. How is it when the screen surrounds the exhaust nozzle?

A. The wear is hardly appreciable.

Q. How do you know that a wire screen located in the smoke-box, like Defendant's Exhibit D, will warp?

A. Well, from observation.

Q. Observation of what?

A. Having a screen placed around the exhaust pipe and putting it in there perfect and seeing it in a few days all warped up.

Q. Where did you make that observation?

A. In Phillipsburg, N. J.

Q. How long ago?

A. About fifteen years ago.

Q. About fifteen years ago?

A. Yes, sir.

Q. Was that screen used as a spark-arrester?

A. No; it was merely an experiment.

Q. Was it intented to be used as a spark-arrester?

A. If the results were good. They did not know but what it might do.

Q. That was the intention of it?

A. It was put in for that purpose, to try it. That was after this Kearny matter came up.

Q. Do you find the wire-screen gauze you are now using

342 in the smoke-arch to warp?

A. Yes, sir; we have found that to be the case.

Q. Does it become inoperative when it warps?

A. If it gets above the nozzle, so that the exhaust strikes it.

Q. Do you know of the same thing being used on other roads—the extension smoke-box with wire gauze?

A. Well, I have seen it on other roads; I have seen the arch. I never examined the inside.

Q. On how many roads have you seen it?

A. I have seen it on the Long Island road and on the Pennsylvania road.

Q. Have you not seen it on the New York Central?

A. No; I never visit over in that section of the city. I hear they have it there.

Q. Do you not know it is in general use on all the main lines of the country now?

A. No, sir; I do not.

Q. Do you think that the diamond smoke-stack is better than the extension smoke-box?

A. That is our experience.

Q. Have you taken it out of the locomotives which had it?

A. There is one locomotive running with it and one in the shop that they are taking the extension off.

343 Q. Do you think it would be an advantage to take out the

diamond stack and put in screens like Complainants' Exhibit Defendant's Screen?

A. With the extension arch?

Q. I say do you think it would be an advantage to take out the diamond stack and put in spark-arresters like Complainants' Exhibit Defendant's Grating?

A. Yes, sir; I think that that is better than the diamond stack for arresting fire.

Q. You know that the patent has expired, do you not?

A. I do not; I do not know when the patent was got.

Q. Supposing the patent had expired and you did not have to pay anything for it, then why would you not use those gratings instead of the diamond stack?

A. I have no authority to use anything of the kind.

Q. Then you are merely giving your own private opinion in the matter?

A. Yes, sir.

Redirect examination:

Q. Does the wire netting in the extended smoke-arch come down near the bottom where the coals lie?

A. No, sir; it is about—well, between two and three feet above, at the top of the smoke-arch door—that is, with the engine we have in use.

344 Q. In the form of arrester shown on the blue print at the right-hand upper corner, you understand that the wire-netting part would come pretty well towards the bottom of the smoke-arch, would it not?

A. Yes, sir.

Q. On this scale of one and a half inches to twelve inches it would come within nine or ten inches, would it not?

A. Yes, sir; I have seen it put in that way in ordinary arches.

Q. Then, if there were coals in the bottom of this smoke-arch, filling up to and against the wire netting, and the air should cause them to burn, what would be the effect on that wire netting?

A. It would warp the wire netting very badly, and also burn the arch.

Q. Do you think that the wire netting would last any much time if hot coals came against it?

A. No, sir.

A recess was then taken.

345 *After Recess.*

Lewis J. Lyons, a witness produced on the part of complainants, being duly sworn, testified as follows:

Direct examination (by Mr. Harris):

Q. Where do you live and what is your business?

A. I live at 332 Mt. Prospect avenue, this city, and my business is steam boiler manufacturer.

Q. How long have you been engaged in the manufacture of steam boilers?

A. Since 1836.

Q. Do you know the form in which diamond stacks for locomotives have been made from manufacturing them yourself?

A. Yes, sir.

Q. About when, and for what railroad, did your ever manufacture stacks?

A. Well, I could not say positively as to the time; it is a good many years ago. I have made them for the Morris & Essex railroad, and I think some for the Pennsylvania railroad. It was before the Morris & Essex was transferred to the D., L. & W.

Q. I show you a diagram which I made and showed you a few days ago.

A. Yes, sir.

346 Q. It shows two stacks—a straight stack and a diamond stack.

A. Yes, sir.

Complainants' counsel offered in evidence the diagram shown this witness, and the same was marked "Complainants' Exhibit Lyons' Diagram."

Defendant's counsel objected to the same as immaterial and irrelevant.

Q. Do you know the construction shown by these two drawings on this exhibit, what they mean?

A. I do, sir.

Q. Of what kind of iron have you made an estimate of the cost of constructing these?

A. Well, No. 10 gauge.

Q. Have you made a careful estimate of the cost of material and labor in the construction of those two stacks when made of No. 10 iron?

A. Yes, sir.

Q. What do you make the cost of material and labor in constructing a straight stack?

A. $8.00.

Q. What do you make the cost of material and labor in constructing a diamond stack?

A. $19.20; that is simply for the stack alone—no mountings to it.

347 Q. Each of these stacks would need the same mountings for attachment to the locomotive?

A. Certainly; they want a base piece for fixing to the locomotive boiler, and that is bolted on——

Q. You have figured them without figuring for any ornaments on either one?

A. Yes, sir; simply the plain stack.

Q. When you made those stacks for the M. & E. road, did you also make the cone and the netting which was put in them?

A. I do not think we made the netting. I am pretty sure we made the cone, but not the netting; I think that was purchased.

Q. Do you know with reference to the use of a diamond stack with cone and netting as to the wear of such a stack compared to a perfectly straight stack?

A. I think I could give a very satisfactory answer to that, because if I was on the road and could see the difference between the wear and tear of a straight pipe and a diamond pipe, then I should be able to——

Q. You have not a recollection of how often you made them which would enable you to answer that question; is that the case?

A. No, sir; I have not; that is true.

348 Counsel for the defendant objects to the testimony of this witness as wholly irrelevant and immaterial to the issue and declines to cross-examine him.

PETER FAGIN, a witness produced on behalf of the complainant-, being duly sworn, testified as follows:

Direct examination (by Mr. HARRIS):

Q. Where do you live and what is your employment?

A. Boiler-maker. I live in Plane street; I don't know whether it is 659 or what it is; I just moved there lately.

Q. You live in Plane street, this city?

A. Corner of Plane and Academy.

Q. And you are a boiler-maker?

A. Yes, sir.

Q. Where are you employed?

A. At Lyons & Co.; that is my boss just went out.

Q. Do you know what a diamond stack is on a locomotive?

A. Yes, sir.

Q. How do you know what it is?

A. I used to make them at one time.

Q. For what company and where?

349 A. Morris & Essex.

Q. And where?

A. It is now called the Delaware, Lackawanna & Western.

Q. No-, where was the shop?

A. In Broad street.

Q. In this city?

A. Yes, sir; and in Hoboken. We moved to Hoboken from Broad St., the corner of Broad St. and Morris — Essex Railroad avenue.

Q. Have you made many of those stacks?

A. I guess I made as many as a dozen or twenty or so on.

Q. What kind of a stack and spark-arrester was the company using when you were working for them?

A. They were using them then.

Q. Yes; what?

A. They were using the diamond stack with the cone inside and the netting up over the cone.

Q. Did you ever work at putting in the cone and netting in those stacks?

A. Yes, sir; I made the stack out and out.

Q. How is the netting put in?

A. Well, you went up about four inches above the top of the cone and the cone fastened on the straight part of the pipe, on the
350 bottom, with three braces on it. I don't know as there is any harm in my showing it to you.

Q. Have you a diagram showing how it was put together?

A. Yes, sir.

(Witness produced a drawing, which was hereafter marked "Complainants' Exhibit Peter Fagin's Stack.")

Q. What does this drawing represent which you have just now produced?

A. That represents—this we call the boiler down here (indicating). This here saddle sets on top of the boiler; that is what we call the base.

Q. And the smoke-stack?

A. Yes; this inside connects with two rivets on each side, with three braces afterwards. You cannot but make two the way it is now. This connected here (witness indicated his meaning by reference to the diagram "Complainants' Exhibit Peter Fagin's Stack") and held the cone on top four inches from the end.

Q. The line extending from side to side in a curve with dots on is intended to represent what?

A. That is wire netting.

Q. What is the purpose of that wire netting?

A. That is for the purpose of preventing the sparks from flying into the woods.

351 Q. From going out of the locomotive?

A. Exactly. This cone shoves it on each side.

Q. The inverted cone which is shown on this drawing is, you say, for the purpose of pushing the sparks on each side?

A. So they don't go right straight through. If that was not there they would go right up.

Q. How long did you work in the D., L. & W. shop while they were using this kind of netting on their engines?

A. About two years to two and a half years before this. Of course, I worked years before that, but not steady, for the company. I worked for Mr. Lyons, but used to do jobs up there.

Q. But during the two years you worked steadily for the company?

A. Yes, sir.

Q. Did you have anything to do with repairing this cone and netting in the shop?

A. Yes, sir.

Q. How long, with the ordinary running of a locomotive, would this netting last before it would have to be replaced with a new one?

A. Well, sometimes it would last, to my knowledge, not more than two months before it would burn a hole through here (indicating).

352 Q. A couple of months before it would burn a hole through?

A. Yes, sir; and, of course, you could not exactly tell what was the matter in here until you took out this part with the bolts in, and we would find out whether it was cut here or cut there.

Q. Would you patch them before you put in a new one?

A. We had to put on a new one.

Q. Did you sometimes patch them?

A. We put on a piece of netting right over the hole if an engine wanted to go out in a hurry.

Q. Generally, when they got holes in, you would put a new one in?

A. Yes, sir.

Q. How often would you say you had to renew that netting and put in a new one?

A. From two to three months sometimes, according to how the engine was running. On account of her running harder she would sometimes burn out quicker; sometimes burn out quicker.

Q. Do you know how long it would take you to put in a new netting and how many men it would take?

A. It would take three men.

Q. For how long?

353 A. We had to take out these bolts because they didn't work good. You had to get new bolts and get the netting back in a circle four feet or five feet or three and a half feet, whatever it was.

Q. You had to cut out a circle in the netting?

A. Yes, sir.

Q. And put it in?

A. Yes, sir.

Q. And bolt it together?

A. Yes, sir.

Q. How long do you think, on an average, it took three men to put in a new netting in one of those stacks?

A. We could do it in a couple of hours.

Q. In a couple of hours?

A. Yes, sir; but we could not finish the job on the engine.

Q. I mean just to put one in.

A. Yes, sir. The machinist had got something to say about that on the engine.

Q. These cone and netting spark-arresters—how long would one of these diamond stacks run on a locomotive ordinarily?

A. I could not say exactly.

Q. As long as the locomotive would last?

A. No, sir.

Q. About how often, do you think, did you have to get new
354 stacks—every once in awhile?

A. Yes, sir.

Q. About how often?

A. I suppose 8 or 9 months was long enough for a stack to run before she wore out inside; sometimes a year, as far as my knowledge goes. Some burn out quicker than others.

Q. At the time you were with the company were they using any other kind of spark-arrester excepting that?

A. No, sir; not that I know of.

Q. Then that is the only kind that you know about?

A. That is all.

Counsel for the defendant objected to the testimony of this witness as wholly irrelevant and immaterial to the issue and declined to cross-examine.

The paper produced by this witness is offered in evidence and marked Exhibit "Fagan Smoke-stack," for the complainant-.

Objected to by defendant's counsel as irrelevant and immaterial.

355 James Turner, a witness produced on behalf of the complainant-, being duly sworn, testified as follows:

Direct examination (by Mr. Harris):

Q. Where do you live, and what has been your occupation in the past?

A. #104 Eighth avenue, city of Newark; formerly an engineer, but now nothing.

Q. Up to how recently were you an engineer and upon what road?

A. Four years ago.

Q. Up to four years ago?

A. Yes, sir.

Q. You were an engineer upon what road?

A. The Morris & Essex, and then the D., L. & W.

Q. How long had you been an engineer on that road?

A. Fifteen years.

Q. During the time that you were an engineer on the road what kind of spark-arresters were in use on the engine that you ran?

A. Kearney & Tronson was put on.

Q. And what other kind?

A. No other kind excepting the diamond stack.

Q. Do you remember about what time the Kearney & Tronson arrester was put on your engine?

356 A. I think about September, 1869.

Q. In September, 1869?

A. Yes, sir.

Q. I will show you a grating marked "Complainants' Exhibit No. 5" (doing so). Was the arrester you called the Kearney & Tronson arrester made of a grating like that?

A. Yes, sir; like that.

Q. How long was that arrester which was put on, as you remember, in September, 1869, in use on your engine?

A. It might have been about three years.

Q. When was it taken off?

A. It was taken off in the summer of 1872, I think.

Q. Who was then the master mechanic on the road?

A. Mr. Lewis was, when it was taken off.

Q. Do you know how long he had then been master mechanic?

A. He came in the winter some time, and this was taken off in the summer following.

Q. Did you have more than one set of gratings on your locomotive during that time?

A. No, sir; not that I remember.

Q. Do you know whether it was broken or out of order during that time?

A. I do not think it was broken. She went to the shop to be overhauled, and when she came back the grating was out.

357 Q. You now speak of 1872 when it was taken out?

A. Yes, sir.

Q. Was it in order when it was taken to the shop?

A. I am sure I cannot tell; it must have been worn quite some, but I do not think it was broken.

Q. At the time you were using this grating was there a straight stack on the locomotive?

A. There was a—no; there was not a straight stack when we were using that.

Q. What kind of a stack was it?

A. It was a kind of diamond-shaped stack.

Q. Had it any netting in at the top?

A. Yes, sir.

Q. No; at the time you were using Kearney & Tronson's?

A. No; it had no netting in at all. It was an old-fashioned kind of a stack. It had a netting in at the side, but it was all open.

Q. Do you mean up at the top of the boiler?

A. At the top of the stack.

Q. But the centre was all open?

A. Yes, sir.

Q. At the time you were using this grating down at the bottom would it stop the coals so that they would collect in the smoke-arch?

358 A. It stopped them until they collected up near the top of the nozz*el*; then they broke it up and got it out somehow.

Q. Then the smoke-arch would fill up with coal at the bottom, would it?

A. It would fill up, nearly up to the grating.

Q. Do you know whether these coals which were drawn in there would burn in the smoke-arch?

A. I have seen them in the front when I have opened the door, that they have been red, sometimes, between the nozz*el* and the front end of the door; that has been when I have stopped, when there was a piston broken or something, and I have opened it to see which side of the engine was broken.

Q. When the engine was not running would the coals die out in there?

A. Yes, sir; all die out.

Q. And when the engine was steaming and running would it make them hot and red in there?

A. Underneath it.

Q. The coal or the pieces that are drawn through from the fire-box are pieces of coal which are not yet burned up, oftentimes?

A. Oh, yes; there is a good deal that is not burned at all. 359 It draws it through the tubes.

Q. Do you mean the draft made by the petticoat pipe draws the coals through the tubes?

A. It has most all to do with the front end of the engine; it can be regulated; it draws dead coal through as well as live coal.

Q. During the time that the Kearney and Tronson grating was not in, what kind of an arrester was there on your locomotive?

A. Well, at one time there was a kind of patent stack all full of pigeon-holes—I couldn't hardly describe it to you—that Mr. Lewis got, but when we did not have them (indicating the grating) in we had the cone and diamond stack.

Q. Do you know how long the netting in the diamond stack would last with the ordinary use of a locomotive?

A. Sometimes it would last longer than at others. I suppose three or four months. I could not exactly tell. Mine used to give out a good deal.

Q. Would it then have to be renewed?

A. They often patched my stack, and if I hadn't time to get to Hoboken for them to patch it I used to put a patch on myself.

Q. What made it cut out so repeatedly?

360 A. I do not know, without it was the exhaust. I suppose it might be probably sometimes the exhaust was not exactly straight and would strike one part of the netting without striking the cone straight; it might be that way; I don't know.

Q. But you say that it would cut it out so that you had to have it repaired or a new one put in every three months?

A. Yes, sir; I would have to have a new netting in about every six months anyway.

Q. Suppose that, instead of a cast grating like these gratings with vertical slots, there should be in place of that a wire netting in the bottom of the smoke-arch, what would be the effect of the hot coals you have described on a wire netting like Defendant's Exhibit Wire Netting?

A. Well, I could not tell in the smoke-arch, I am sure. I could not tell what the difference would be.

Q. Do you think that this wire netting would stand hot coals like a piece of cast grating?

A. No, sir; it would not stand it the same as cast iron—any hot fire nor hot draft, either.

Q. Have you ever tried an engine having this wire netting in the same place as where the casting was used?

361 A. No, sir.

Q. Only those with the wire netting up in the diamond stack?

A. That is all.

Q. Have you ever on the locomotives you have used tried cast iron and wrought iron in the same situation where the hot coals came in contact with it?

A. Yes, sir.

Q. What way?

A. Why, the front end of the flues in the fire-box—flue sheets.

Q. You mean in front of the flues in the fire-box?

A. Yes, sir.

Q. You tried the two different kinds, do you mean?

A. Mr. Kearney tried them with my engine. He put in wrought iron first, and about the first twenty-four hours it burned out, and then he put in cast iron, and that lasted something about a week; but both melted.

Q. That was in front of the flues, to keep the coal from getting into the flues, was it not?

A. To keep the fire and coals from going through the flues.

Q. Then in the instance that you speak of cast iron in the same place stood it six or seven times as long as wrought iron?

362 A. Well, it stood it near a week longer; but they were both a great deal heavier than this wire netting

Q. Did you ever in any other way try the difference between wrought iron and cast iron in standing the heat?

A. I do not remember, sir.

Q. What is the difference in the way the fire goes out of the top of a straight stack and a diamond stack, as to going straight up or going in an angle?

A. The straight stack throws the sparks and fire right straight up and a diamond stack scatters it.

Q. With which kind of a stack will the sparks the sooner fall to the ground?

A. They will fall to the ground quicker from a diamond stack; at least, the ones I used did.

Q. Were the company particular or not that these spark-arresters should always be perfect and in order?

A. Yes, sir; they were very particular about them being reported. They were not so particular about sending to repair them.

Counsel for defendant objects to so much of the testimony of this witness as relates to the diamond stack as irrelevant and immaterial to the issue.

363 Cross-examination (*de bene esse*) by Mr. McCallum:

Q. What was the name of the engine which you ran on the D., L. & W. having the Kearney & Tronson grating?

A. "Willie Sloane."

Q. I think you said it did not have a straight stack?

A. I did have a straight stack, but I could not tell whether it was the time I had that patent machine in or not; whether it was before or after. I could not swear to it.

Q. Did you run more than one engine with the Kearney & Tronson device?

A. No, sir.

Q. You said in your direct examination it was a diamond stack of some kind with netting on the top, and now you say you do not know what it was.

A. No, sir. I had a diamond stack during the time, but I could not tell what time it was. It had a netting and the centre was open, but the netting came from the outside of the stack to the top of the inside pipe.

Q. What was the use of that netting?

A. I don't know, sir; no use at all, as far as I could see.

Q. Was that taken off and a straight stack put on when the Kearney & Tronson grating was used?

A. No, sir; when that was taken off a diamond stack was put on.

364 Q. Could you make a sketch of the stack which you used?

A. No, sir.

Q. Have you a sufficiently distinct recollection of it at this time to say positively how it was constructed?

A. How the stack was constructed?

Q. Yes.

A. It was a diamond stack; the same as was on that one there (indicating).

By Mr. Harris:

Q. When the Kearney arrester was used?

A. Well, it was the same shape as a diamond stack—the same, shaped stack.

Further cross-examination:

Q. If I understand you right, it was a diamond stack with a Kearney & Tronson grating in the smoke-box. Is that right?

A. Yes, sir; that was in the smoke-box.

Q. And it was a diamond stack?

A. Yes, sir.

Q. And you never used a Kearney & Tronson device with a straight stack?

A. No, sir; I believe not. I could not say anything about a straight stack.

Q. What was the Kearney & Tronson grating made of?

365 A. Cast iron, sir.

Q. Did not Mr. Kearney try one made of wrought-iron rods hooped together?

A. Well, he tried one of that description in the front end of the flue in the fire-box in my engine, but not in the front end.

Q. You said that the smoke-box would fill up when the Kearney & Tronson grating was used; how high on the grating would it fill up?

A. Well, it would fill up a little on the grating, but it never reached the top of the nozzel. It would work itself out from there. I found it was very little use shoving it out, for it soon filled up that part again, so I used to let it go for months without shoveling it out.

Q. You let the engine go for months without shoveling out the sparks?

A. Yes, sir; for it got it out itself. It would work it up and get out the best way it could.

Q. And it did not stop the sparks from going out?

A. No, sir; it worked around and broke it up fine—the exhaust worked around.

Q. Then if the sparks remained in the box for months without being shoveled out, they did not burn much, did they?

366 A. Well, they couldn't burn excepting just when you would stop, because you would keep sending it out, you know—working it up, mashing it up.

Q. Did it not interfere with the draft somewhat when it was choked up in that way?

A. No, sir.

Q. It did not?

A. Not with me, sir, it didn't choke up.

Q. Then, as far as breaking up and making the sparks fine was concerned, do you think it made any difference whether the holes were long holes or holes like the ones in the wire netting?

A. Oh, I could not tell. I never had any experience with anything else.

Q. You have had experience with diamond stacks?

A. Yes, sir.

Q. Did you notice whether the sparks were any bigger that came out of the diamond stacks than those that came out of a stack with a grating with slots in it?

A. They were very little, without the netting was worn out. If the netting was good, the sparks were but very little bigger.

Q. If the netting was whole, the sparks were the same as they were with the other, were they?

367 A. Very little difference, sir; I could not tell the difference.

Q. Were they not smaller?

A. I am sure I could not tell you. The sparks came out with both—the sparks came out, you know, with both of them.

Q. The sparks came out with both of them?

A. Yes, sir.

Q. But you could not tell as to the size?

A. No, sir.

Q. You never had any experience with netting in the smoke-box?

A. No, sir; none.

Redirect examination:

Q. Then, your recollection is that when you had the grating put in you had the same diamond stack, but it was open and clear, without any cone or netting in the middle?

A. There was a cone in the middle of that stack.

Q. But no netting?

A. No; no netting.

There is one mistake I made in the name of the engine. It was the "Grace" instead of "Willie Sloane."

368 JOHN GOMER, a witness called on behalf of the complainants, being duly sworn according to law, testified as follows:

Direct examination (by Mr. HARRIS):

Q. Where do you live and what is your present employment?

A. I live at 16 Pine street, in the city of Newark. I am a machinist, in the employ of Seymour & Whitlock—foreman in Seymour & Whitlock shops.

Q. How long have you been thus employed as a machinist?

A. Well, I am 49 years of age and have been employed at it ever since I was 17 years of age; all my lifetime.

Q. Have you examined "Defendant's Exhibit Blue-print Spark-arrestor," which I now show you, before?

A. Yes, sir; I have seen that.

Q. Who showed it to you?

A. You showed it to me.

Q. Do you understand what is represented in that drawing?

A. I understand there is a box here attached to the locomotive there (indicating).

Q. For what purpose?

A. That is to receive the sparks from here, I presume; the coal sparks.

Q. Are there attachments for the purpose of forcing coals and sparks into this receiver?

369 A. Yes, sir; as I understand it, it is here (indicating).

Q. Jets of what?

A. Jets of steam; that is my understanding of it.

Q. Is there also an arrangement for making an exhaust in this box?

A. Producing a vacuum?

Q. Yes.

A. Yes, sir; that is done by this pipe here; that will naturally draw through this piping when the exhaust goes up there; that would be a natural result, and that is evidently the object of it, to my understanding; that would produce a vacuum here which would tend to draw the coals there; that seems to be the object of that, to get away with the laying around here, which would burn out if it got hot.

Q. Have you made an estimate of the cost of constructing that spark-box and its attachments upon a locomotive?

A. Do I understand you this connection here (indicating on blue print)?

Q. This spark-box and its connection and attachments with the locomotive.

A. Yes, sir; I looked over this drawing, and assuming that to be a cast-iron pot with a joint in the center, which must be an air-tight joint, and also an air-tight joint at the bottom and an air-
370 tight joint there to effect this vacuum; yes; I have thought
that matter over considerable and believe that I made an estimate in my mind; I have not made any figures in regard to weight, &c., but from the general knowledge of the time it takes to do work, it would seem to me that thing could not be done for less than $100. These joints must be air-tight, and then these pipes put in and these connections made and carried from the boiler. It seems to me that matter would use up $100, to the best of my judgment.

Q. In your business as foreman, are you familiar with the cost of mechanical constructions of such a character?

A. Part of my business is to estimate what a piece of work is going to cost from the drawing; that is part of my business.

Q. And you are frequently doing that?

A. Yes, sir; that is part of my business; I sometimes make mistakes, like everybody else, but even it about as well as the rest of them, I guess.

Q. From your experience in your business, do you know the effect of heat upon iron?

A. Yes, sir; I have seen considerable of it.

Q. Will you examine this piece of casting which I show you (defendant's grating), and also this pieces of wire netting
371 (Defendant's Exhibit Wire Netting), and state, if you can,
relatively, which of these would best stand the effect of heat and hot coals?

A. Well, it is a pretty hard matter to tell in regard to the wire. If that casting was made the same as that grating, made this way instead of upright, it would not last a quarter as long as this will. This has the support straight all the way up. If it should get hot it has a straight support all the way from the bottom. If it was made in this way the weight would be resting on the hot part and sag up. That is the reason it was made that way, probably—to overcome it—but that wire netting would not stand any heat at all. The fact of this part being straight up and down would tend to stiffen it if it got hot, and it would stand the heat a great many times better than it would if it was crossways.

Q. How, with reference to the fact that one of these is cast iron, with the size of bars such as you see, and the other of drawn wire of the size you see—what would, in your opinion, be the relative power to withstand heat and hot coals of these two pieces in the form which you now see them?

A. Well, that is a pretty hard question to answer. In the first place, nobody uses wrought iron where it is subject to heat
372 such as a grate bar is subject, for the simple fact that it won't

stand. It melts out of shape and loses its form. Wrought iron is different from cast iron and won't stand any such heat as cast iron will without getting out of form. It would seem to me that wrought iron in that form would not stand long, and another thing: that wire netting would get clogged up where the castings would not. I don't know how you get at the idea of the difference in the duration of that.

Q. Have you any opinion which you formed with reference to that matter?

A. The duration of the one grate over the other as a grate?

Q. Yes.

A. Well, I don't know. You might say ten or twenty times for the sake of an answer, but I don't know how many times it would be, really. There is no comparison.

Q. There would be no comparison between the two?

A. No, sir.

Q. Where there was hot coals?

A. Where they were subject to heat. That is what I mean—any great heat. The wire would get out of form very readily.

Q. And you said also burn up.

A. And before it burned it would get out of form and it
373 would naturally burn.

Q. Is it a common thing to construct furnaces of cast iron where the hot coal and intense heat come against the cast iron?

A. I never saw a grate bar of wrought iron excepting where it had been put in for a makeshift doe a few days.

Q. Furnaces are made with cast-iron bars, are they not?

A. Yes, sir; all cast iron.

Q. But none of wrought iron?

A. I never saw any wrought iron; they won't stand.

Q. You have never worked in a locomotive shop, have you?

A. No, sir.

Cross-examination (by Mr. McCallum):

Q. Have you ever made any experiments to test the question whether a cast-iron grating like complainants' exhibit shown you or a grating made of wire netting like that shown you will serve best in a smoke-box of a locomotive engine?

A. No, sir; I never made any experiments of that nature.

Q. Have you ever made any experiments to test which of the materials of which these two things are made will stand heat best?

A. No, sir; all these ex-eriments were made before my time.

374 Q. You never made any experiments?

A. No, sir; these things we settled long ago.

Q. Do you know whether such things are subjected to great heat in the fire-box of a locomotive?

A. I don't know what heat there is there. I can only imagine that it would be the heat produced by red-hot coal.

Q. I don't want to know what you imagine, but only what you know.

A. I don't know what the temperature is.

Q. Do you know what the furnace of a locomotive is made of—what kind of metal?

A. The furnace?

A. Yes; I am not talking of the grate, but of the furnace.

A. The fire-box is made of boiler iron.

Q. That is not cast iron, is it?

A. The fire-box, I believe, is made of wrought iron; boiler iron the outside, usually.

Q. That is wrought iron?

A. Yes, sir.

Q. It is not cast iron?

A. Not the fire-box; so far as I know, it is made of wrought iron.

Q. Not cast iron?

375 A. That is my judgment—my knowledge.

Q. You know that the grate bars are made of cast iron?

A. Yes, sir.

Q. And you know that they burn out and have to be renewed?

A. Yes, sir.

Q. Did you ever know of a grating made of wrought iron?

A. I never saw one and never heard of one.

Q. Then you don't know whether they burn out or not, of your knowledge?

A. No, sir; I never saw one.

William Martin, a witness called on behalf of the complainants, being duly sworn according to law, testified as follows:

Direct examination (by Mr. Harris):

Q. Where do you live and what is your employment?

A. I live at 49 Pennington street; I am a machinist by trade.

Q. Where do you work and what is your situation at the present time?

Q. I work for the firm of Cyrus Currier and Sons—superintendent.

Q. What is the business which they carry on?

376 A. Manufacturers of steam engines, embossing engines, &c.

Q. They have a large factory in this city?

A. Yes, sir.

Q. How long have you been in the engine shop?

A. Well, I have been in the engine shop about 30 years.

Q. Do you know from your experience in your business the relative power of wrought iron and cast iron to withstand heat?

A. Well, all the experience that I have had shows that the cast iron in engine heads would last longer than the wrought.

Q. Do you know why that is?

A. Well, I suppose the wrought iron being worked over and made softer the heat has more effect on it than it would have on the cast iron.

Q. You may look at this piece of casting called defendant's grating and at this piece of wire netting called Defendant's Exhibit Wire Netting and state what would be the relative durability of these metals in that form to withstand the effect of hot coals against them.

A. I should think the casting would stand more heat than the wire netting.

Q. Very much?

377 A. Yes, sir; I think a good deal more.

Q. As to metal bending when heated, is there a difference between cast metal and wrought metal?

A. Yes, sir.

Q. In favor of which, as to withstanding a*m*ything tending to push them out of place?

A. Well, I think the cast iron would stand more strain than the wrought iron would.

Q. Is there such a thing as an iron burning from the heat?

A. Yes, sir.

Q. Which would require the greatest heat to burn the iron?

A. The cast iron would require the greatest heat. I think it would take in the neighborhood of 2,400 degrees to burn a casting, while the wire netting would burn at about 1,900 or 2,000.

Q. At what heat would this wrought iron be so that it would be easily bent out of shape?

A. What degrees of heat?

Q. Yes.

A. Well, I should think in the neighborhood of 800 or 900 degrees you could bend it very easily.

Q. Would a cast-iron grating be bent easily without a good deal more heat than that?

A. No, sir; I don't think it would.

378 Q. Will cast iron bend easily or spring out of place until you get a heat almost sufficient to burn it up?

A. No, sir; I don't think it would.

Q. Are you thoroughly familiar with the effect of different degrees of heat, ascertained from your experience in the business?

A. Well, I never have had much experience—that is, to experiment with it. It will take 2,800 degrees of heat to melt a casting in a cup*alo*.

Q. Will wrought iron melt at a much less heat?

A. I think wrought iron will melt at about 1,900.

Q. And it becomes pliable at a very much less heat?

A. Oh, yes; it becomes pliable at less heat.

Q. What is the effect of frequently heating wrought iron by having hot coals come against it?

A. Well, I think, in heating it, after awhile it would get corroded and drop off.

Q. Much more quickly than cast iron?

A. Yes, sir.

Q. Do you get a heat sufficient to effect either of these irons from a flame some distance from the coal or is it necessary to have the burning coal come in contact with them to affect them much?

A. Well. I think that the burning coal would have more effect—quicker—on it than it would with a flame.

379 Q. Then a wire netting which might stand a flame at some distance from the fire would not so well stand hot coals against it, would it?

A. No, sir.

Q. In the factory where you are superintendent and where you have gained your experience are you constantly working both with cast and wrought iron?

A. Yes, sir.

Q. And with the effect of fire upon them?

A. Well, only in the forge—that is, wrought iron in the forge.

Counsel for the defendant objects to the testimony of this witness as wholly irrelevant and immaterial to the issue.

Cross-examination (*de bene esse*) by Mr. McCallum:

Q. Have you had any experience in a foundary?

A. No, sir.

Q. Have you ever made any experiments in the melting of metals?

A. No, sir.

Q. You have spoken of some knowledge of forging. What is that?

A. Only what I have seen the blacksmith do in the shop.

Q. You have made no practical experiments yourself?

380 A. No, sir.

Q. The blacksmith does not operate with cast metal, does he?

A. No, sir.

Q. Then you really have no practical experience as to the relative durability of cast iron and wrought iron under the action of heat, have you?

A. Only what I have seen.

Q. Have you ever seen the interior of a locomotive fire-box?

A. No, sir.

Q. Do you know what the furnace of a locomotive is made of?

A. Made of wrought iron, I suppose.

Q. It is not made of cast iron?

A. Only the grate.

Q. Have you seen a furnace grating with wrought-iron supporting bars and cast-iron grate-bars?

A. I have never seen any, only in case the bearer would get down in the boiler, and that would do for a makeshift to keep it up until another one was fixed.

Q. What are the flues of a boiler made of?

A. Wrought iron.

Q. Not cast iron?

A. No, sir.

Q. What is the smoke-box of a locomotive made of?

381 A. The smoke-box?

Q. The smoke-arch?

A. Well, I don't know anything about a locomotive.

Q. Then the opinion which you have given is not derived from any practical test, but merely from what you saw others do?

A. That is all, sir.

Redirect examination:

Q. Do you know whether or not all around the flues and around the fire-box of an ordinary locomotive there is water or steam on the other side of the iron?

A. No, sir.

Q. Do you know to what degree of heat water is raised to give a certain pressure of steam?

A. No, sir; I am not familiar with that.

Q. Do you know whether or not it is possible to make boiler iron red hot when there is water on the other side of it?

A. No, sir; I do not think you could do that.

382 JAMES M. JOHNSON, a witness called on part of the complainants, being duly sworn according to law, testified as follows:

Direct examination (by Mr. HARRIS):

Q. Where do you live and what is your occupation?

A. 12 Pine street; occupation, machinist.

Q. In what factory is your employment at the present time?

A. Cyrus Currier & Sons.

Q. How long have you worked in that factory?

A. 18 years.

Q. In your employment in that factory, in their building of engines, have you become acquainted with the relative power of wrought and cast iron to withstand heat and heated coals?

A. To no great extent; no, sir.

Q. Do you know whether there is a difference between the power of cast iron and of wrought iron to withstand heat?

A. I think I do.

Q. Which will stand heat the best?

A. Cast iron.

Q. Very much better than wrought iron?

A. Yes, sir.

Q. You may look at this grating, defendant's grating, and 383 also at the wire netting, Defendant's Exhibit Wire Netting, and state which of those, if the coals came in contact with them, would stand longer.

A. The iron grating.

Q. Which would first bend and get out of shape from the effects of heat?

A. The netting.

Q. Which would first burn up and be consumed by the effect of heat?

A. The netting.

Q. How do you know that fact, Mr. Johnson?

A. Well, only from observation; that is all.

Q. Have you seen the effect of heat upon the bars of fire-boxes or furnaces where there were both cast and wrought iron?

A. No, sir; I don't know that I have.

Q. What are the parts where the fire comes in contact and where there is no water on the other side made of usually?

A. Where it comes in contact with fire and no water?

Q. Yes.

A. Cast iron?

384 Q. Do you know of wrought iron being used at all excepting where it is part of a boiler and where the water is on the other side?

A. No, sir.

Counsel for the defendant objects to the testimony of this witness as wholly irrelevant and immaterial to the issue.

Cross-examination (*de bene esse*) by Mr. McCallum:

Q. Have you ever made any experiments?

A. No, sir.

Q. Have you any knowledge in respect to locomotive boilers?

A. No, sir; very slight.

Q. Have you any knowledge respecting spark-arresters in locomotives?

A. No, sir.

385 Peter Tronson, a witness called on behalf of the complainand-, being duly sworn, testified as follows:

Direct examination (by Mr. Harris):

Q. Where do you reside, and what is your present occupation?

A. I reside at Montclair, N. J.; I am a locomotive engineer.

Q. Is Mary F. Tronson, one of the complainants in this suit, your mother?

A. Yes, sir.

Q. How long have you been a locomotive engineer?

A. 26 years.

Q. And by what company have you been employed during that time?

A. The Morris & Essex until they leased to the D., L. & W. I have continued right on the Morris & Essex for 26 years.

Q. When you were first an engineer on the road what kind of a stack and spark-arrester was in use on the locomotive run by you?

A. When I first commenced running we were all burning wood at that time, and we had a large stack which had a cone and wire netting in for spark-arrester.

Q. When they began to burn coal on the engine what kind of a stack and spark-arrester did they have then?

386 A. Then we had what was termed a diamond stack. That also was termed a cone and netting.

Q. Since you first commenced running an engine with a diamond stack have you at any other time used any other stack and arrester than a cone and netting?

A. Yes, sir.

Q. What did you use?

A. This grating here termed the "Tronson & Kearney spark-arrester."

Q. What kind of a stack?

A. A straight stack.

Q. How nearly can you tell the time when your locomotive was fitted with this Tronson & Kearney grating and a straight stack?

A. It was in 1872, in the month of December, that my engine came out of the shop with a straight stack and the spark-arrester.

Q. Do you remember it by any event or any change on the road?

A. Yes, sir.

Q. What was it?

A. At that time Mr. Lewis came here, and I saw him, and parties on the road told me that he was to be our master mechanic,
387 and that day I was laying off or they let me lay down there at Hoboken to get this engine out. I could not say the day of the month, but it was in December.

Q. You are sure of the year?

A. 1872.

Q. He testified that he came on in 1871?

A. Mr. Lewis?

Q. Yes.

A. Well, if he did I am mistaken in the year; but that is as near as I can remember.

Q. It was in December, you remember?

A. Yes, sir.

Q. Of the year he came on?

A. Yes, sir; it was the day he came on.

Q. What run had you at that time?

A. I was running between Hoboken and Montclair.

Q. About how long was the straight stack and the Tronson & Kearney grating retained in this engine that you speak of?

A. Well, I could not positively say just the exact time, but my impression is that I run the engine about two years with the straight stack and patent.

Q. Was Mr. Kearney and also your father in employ of the road at the time this was put in?

A. Yes, sir.

388 Q. During the time that this grating was in use on your locomotive do you know whether it was renewed with new castings?

A. I do not think it was; I am not positive.

Q. Previous to this being put in you had been running the diamond stack and cone and netting?

A. Yes, sir.

Q. And after this was taken out what was there on your locomotive?

A. Diamond stack, cone, and netting.

Q. What difference is there in the way the sparks, &c., which pass through an arrester leave the smoke-stack in a straight stack and in a diamond stack?

A. Well, the straight stack being perfectly clear, the sparks go directly up, unless there is a heavy wind or something to carry them off that way.

Q. They go straight up?

A. They naturally go straight up.

Q. And how with a diamond stack?

A. With a diamond stack they throw them at an angle in all directions. You cannot tell. They go crossways and all ways.

Q. In which form of stack will the cinders that pass through
most quickly reach the ground or anything that they might
389 set fire to along the track?

A. With a diamond stack.

Q. By reason of their being thrown obliquely?

A. They do not go up in the air so far, and certainly they do not have so far to fall.

Q. Is there or not a difference which you have noticed in the sparks, &c., coming back in the cab?

A. Yes, sir.

Q. In what way?

A. Well, the straight stack you can run with the front windows open; with a diamond stack you cannot; it will burn you out, burn your clothes or set waste on fire, or something of the kind in the cab, so we do not pretend to run with the windows open with a diamond stack.

Q. Do you know whether upon the engine that Mr. Turner has spoken of, when the grating of Kearney & Tronson was put in, the stack was taken off and changed to a straight stack?

A. I do not.

Q. Do you know whether the cone and netting, &c., was left in the stacks when this grating was put in below?

A. No, sir; I am satisfied that was taken out. They experi-
mented for some time with a bob-tail or two around Newark
390 there, and worked it the best they could with the old stack
on, and eventually tore off the cone and netting, and some engines they left the old stack on and put a straight stack right inside.

Q. So that in effect it was a straight stack, although it looked like a diamond stack outside?

A. Yes, sir; there was only the show outside of the big stack; still it was a straight stack inside. That was when they were experimenting on these castings.

Q. How many were they put in at that time—how many different engines that you know of?

A. I could not tell you.

Q. About how many?

A. I think there was in the neighborhood of seven or eight engines had it on.

Q. And those were taken out gradually after Mr. Lewis came?

A. Well, a short time after Mr. Lewis came here, as anything happened to them, if there was any complaint about them in any shape or form, he would take them off and put in a diamond head and cone.

Q. Had your father at that time been discharged from the employ of the company?

A. Yes, sir.

Q. Was he so discharged when Mr. Lewis came as master mechanic?

391 A. No, sir; he continued to stay here, I think it was, until the latter part of 1872, when my father went away.

Q. Do you know of experiments being made with cast iron and with wrought iron before the furnace flues of any engine up there?

A. I knew there were experiments; I didn't see them, but I knew they were in there.

Mr. McCallum: You refer to the fire-box?

Mr. Harris: Yes, sir.

Q. Do you know whether both wrought and cast iron were tried there?

A. I am not positive about the cast iron—yes, cast iron; but the wrought iron, I know, was put in. Mr. Turner has told me, and told me today about the cast iron, but I never saw either one.

Q. It was not tried in your engine, so that you knew about them burning out, as he has testified?

A. No, sir.

Q. Excepting from hearsay?

A. That is all. As far as this bobtail which he ran is concerned, I never was in Newark long enough to get on the engine; I just passed it back and forth.

Q. Was the diamond-stack cone and netting a durable device as to wear?

392 A. Well, it would wear out the same as other things; but it would wear out much quicker than a straight stack—that is, as far as the netting and cone was concerned; the stack would last a long time, but still they would wear through.

Q. The wire netting cut there?

A. Yes, sir.

Q. Can you tell us how long, in the ordinary running of a locomotive, the wire netting would stand before requiring either repair or renewal?

A. Well, I do not think they would run over three or four months, at the outside, without repair, either putting a patch on or putting in a new netting. It depends a great deal on the engine and how hard the engine was worked. Take it on some of these engines and they would not run that length of time; take it on a light passenger train and they will run longer.

Q. You would consider three or four months the average time of wear of a wire netting in a diamond stack?

A. Yes, sir; before it would require repairing, either a patch or a new one.

Q. It would sometimes be patched a little before they put a new one in?

A. Yes, sir; sometimes, if they had a spare engine to lay
393 the engine up for a couple of hours or three hours. They
would put a little patch on and let it go for a day or two, or sometimes three.

Q. But it had to be repaired very soon after it was patched?

A. Yes, sir.

Q. How long did it take to put in a new netting?

A. To take the stack off and put in a new netting and put the stack back again, raise it up and put it on an engine, would take in the neighborhood of three to four hours. They come down from Kingsland now all cut just the size, so that it does not take as long as it used to.

Q. In what form did the wire netting come formerly, in sheets?

A. In sheets—that is, years ago. It comes in sheets now to the shop at Kingsland, but they have the diameter of the stack, and just cut them out and send them down to Hoboken, and all you have to do is lift the top——

Q. Are those nettings kept there so that they can be applied at any moment when the engine comes in?

A. Yes, sir.

Q. Is it important that this netting should be perfect?

A. Well, yes, sir; the company is very particular about having a hole in the netting.

394 Q. What is the danger if there is a hole there?

A. Well, it throws out larger sparks than would go through the netting if there was a hole, and throws more of them, and there is danger of setting fire to the buildings along the track where they are in close proximity to the rail.

Q. Then, as a matter of fact, it is a very particular thing in operating a locomotive to have a spark-arrester which will prevent fire from being thrown out in large enough quantities to set anything on fire?

A. Yes, sir.

Counsel for the defendant objects to so much of the testimony of this witness as relates to the diamond stack as irrelevant and immaterial to the issue.

Cross-examination (*de bene esse*) by Mr. McCallum:

Q. You at first said the engine you ran with the Kearney & Tronson spark-arrester was so fitted in 1872, and then you changed it to 1871; which of the two do you think is the correct date?

A. 1871.

Q. Mr. Lewis was the master mechanic when it was fitted—when it came out?

395 A. No, sir; well, Mr. Lewis came around the railroad the day that my engine came out of the machine shop, and I was informed that day that that was to be our next master mechanic. I suppose he had been appointed, although we were not aware of it until that day, although he did not take charge that I know of until two or three days after that.

Q. Your father remained in the employ of the company some time after that?

A. Yes, sir.

Q. How long, do you think?

A. Well, I think father quit the road in the latter part of 1872; I could not say what month.

Q. Did Mr. Lewis assign any reason for taking off this spark-arrester and going back to the diamond stack?

A. Yes, sir.

Q. What was it?

A. One of my gratings was—there were, I think, three bars broken across, which I reported it, and they laid the engine off and took the grating out and put on the diamond stack and asked no questions, and I did not. I reported the grating, and that was the cause, I reported three of the gratings being broken.

Q. How long were the gratings continued on the 7 or 8 engines which you think were fitted with them?

396 A. Well, I could not tell; I do not know when they commenced to put them on; I could not say; I do not know what year it was; mine was about the last engine that was fitted up with it, and Mr. Lewis commenced taking them off a short time after he came here.

Q. It ran about two years before it came off?

A. Yes, sir—that is, the engine that I ran; but they were on all the engines except mine—that is, mine was the last engine that was fitted up with it; but they were on six or seven engines that was fitted up before mine, but what year they were put on I cannot say; I ran my engine about two years.

Q. With it on?

A. Yes, sir.

Q. It was fully tested in that time?

A. Yes, sir.

Q. Have there ever been any engine since then fitted with it since yours was?

A. Not that I know off; nothing on our road.

Q. Do you know of its being used on any other road?

A. Only from hearsay.

Q. What have you heard respecting its use?

A. Well, I have heard my mother tell that Mr. Kearney told her it was used on the Lehigh Valley road—just the same
397 patent that father got up; that is all I know about it. I have been told it was used there quite extensively, although I never saw it.

Q. You do not know yourself whether it was the same thing or not?

A. I do not.

Q. Have you made any experiments with any other spark-arrester except those two, the diamond stack and the Kearney & Tronson?

A. No, sir.

The further examination of witnesses, &c., on behalf of the complainant- was then adjourned until Friday, the 20th day of December, 1888, at 10 o'clock a. m., at the office of Messrs. Knight & Knight, in the city of Newark, N. J.

NEWARK, N. J., THURSDAY, *Dec.* 20, 1888.

398 Continuation of case pursuant to adjournment.

Appearances as heretofore.

OSCEOLA CURRIER, a witness produced on part of the complainant-, being duly sworn according to law, testified as follows:

Direct examination (by Mr. HARRIS):

Q. Where do you live and what is your business and how long have you been engaged in such business?

A. Corner of South 11th street and 9th avenue, in this city. I have been engaged in business as a manufacturer of machinery and all kinds of engines and other machinery for the past twenty-five years.

Q. (Witness being shown Defendant's Exhibit Blue-print Spark-arrester, is asked:) Do you understand the drawing shown on this and the construction of the spark-box and its attachments?

A. I do; I have examined it and think I understand.

Q. You have also examined it on the outside of locomotives?

A. Yes, sir.

Q. And you understand the way it is applied?

A. Yes, sir.

399 Q. And the attachments for ejecting the coal from the bottom of the smoke-arch, so as to keep the smoke-arch clear?

A. Yes, sir.

Q. Have you made an estimate of the cost of material and labor for applying that cinder-box and its attachments to a locomotive engine?

A. Do you mean an engine built?

Q. You may state it both ways, if you choose.

A. If it had to be put onto the engine after it was built it would not cost a great deal more than it would if the engine when built was adapted for it. When they build engines, if they were going to put that on as the engine was being constructed it could not be put on for $90 or $100. It would cost more if they had to adapt the engine to it.

Q. What would be the items of general cost to adapt the engine to it?

A. Well, fixing the front plate and cutting out the sheet over the cow-catcher—I don't know what you call it.

Q. Making the openings for the attachment?

A. Yes, sir, and inserting your steam pipes and attachments of the arrestor after it was built.

Q. What, in your estimation, would be the cost of putting it onto locomotives already built and which had not been built expressly for the purpose of having it attached?

400 A. That would be rather a difficult question to answer, because the engine might be constructed so that you could not adapt it just in that shape.

Q. Supposing you could?

A. Well, there are engines built, of course, that it could not be put on just in that shape; you would have to lengthen here or make a change there; but with ordinary engines I suppose it would cost almost double to put it on an old engine that was not adapted to it to what it would cost to put it on one which was built for the purpose of putting it on.

Q. Then I understand you that the construction of this cinder-box and its attachment upon a new locomotive would cost, in your estimation, from $90 to $100?

A. I should judge that ought to cover it. I don't know what this weighs; of course, I only guess at that. I suppose that cast-iron receptacle would weigh from four hundred to five hundred weight.

Q. Is it necessary in the use of such a spark-box that the joints between that and the front end of the locomotive should be perfectly tight?

A. They ought to be.

Q. In your experience in the building of engines and machinery,
do you know the relative power of cast iron and wrought
401 iron to withstand the heat from hot coals coming in contact
with it?

A. That would depend upon the shape and size.

Q. Do you know relatively?

A. Yes, sir; I know relatively.

Q. Of two pieces of iron—the one wrought and the other cast—of the same size, which would the sooner disintegrate or give way from repeatedly being heated?

A. If they were all of the same size and the same amount of heat applied, I think the sheet iron would gradually eat away before the cast iron would.

Q. When wrought iron or sheet iron, as you term it——

A. Wrought iron.

Q. When wrought iron is heated does the surface scale off?

A. The heat burns a scale on, and it keeps dropping off.

Q. Is that the case to nearly as great an extent with cast iron?

A. Cast iron will last longer than wrought iron.

Q. You may look at the grating called the defendant's grating, also at the piece of wire netting called the Defendant's Exhibit Wire

Netting (showing both to witness), and state which would stand the effect of burning coals coming in contact with it the longer.

A. The cast iron would, in my opinion; very much longer.

402 Q. As to the kinds of iron being pliable or warping under heat, which one would warp sooner?

A. This wire would twist out of shape and sag down before the cast iron would.

Q. In your opinion, would that wire netting stand repeatedly becoming re*a*d hot any length of time to speak of?

A. Well, it would for some time, but not as long as the cast iron.

Q. In the construction of fire-boxes, where there is no water on the other side of the iron, is it usual to use wrought iron when the fire comes in contact with it?

A. You would not put wrought iron in a place of that kind unless there was water on the other side or unless you lined it with firebrick, the same as you would a cupola or something like that. Our cupola consists of a similar thing to a boiler shell, and that is lined with firebrick. That firebrick is burned out very rapidly and the wrought iron scales away, and if any dampness strikes it I think it would wear away very much quicker than cast iron.

Counsel for the defendant*s* objects to the testimony of this witness as wholly irrelevant and immaterial to this issue.

Cross-examination (*de bene esse*) by Mr. McCALLUM:

Q. Have you had any experience with locomotive engines and the spark-arrestors used in them?

403 A. No experience in building them.

Q. Have you had experience in running them?

A. Well, I have been on the road, off and on, on engines years ago, over the New Jersey road, and am familiar with the working of engines.

Q. "Years ago." What kind of spark-arrestors did they have then?

A. I don't think they had anything on the Pennsylvania road within the last—well, I don't know exactly when they were adopted, when spark-arrestors *are* put on. I know they used to burn down fences and set grass afire very frequently along the line of the road.

Q. What year was that?

A. That I would be -able to give you.

Q. You say the Pennsylvania railroad, on the New Jersey division, had no spark-arrestors some years ago?

A. Yes, sir.

Q. Is that what you mean?

A. Yes, sir

Q. What spark-arrestor did you see them use?

A. Well, I could not tell, but I have seen them use—I have seen Mr. Kearneys, on the D., L. & W.—I mean the Morris & Essex, which we call the Delaware, Lackawanna & Western railroad now.

404 Q. When was that?

A. That I would be unable to state, the date; that I could not give you.

Q. Can you give the year?

A. No, sir; I could not. I know that when Mr. Kearney was there at work on it, but I could not give the year. If you could tell me when Mr. Tronson died, I migh- possible approximate somewhat.

Q. Is that the only one you ever saw?

A. Yes, sir; that is the only one I ever took any interest in. I might have seen others.

Q. Did you ever see one like Exhibit D, now shown you?

A. No, sir.

Q. That is made of wire gauze, is it not?

A. This is covered with wire net; yes, sir. I would not like to say positively that I have or have not, because I have been at the yard at Jersey City when they have had the front of the engine out, and I have seen the spark-arrestor, but it wasn't fixed in my mind just what shape they were in. I think I have seen wire gauze, and I think I have seen them with longitudinal and horizontal bands—that is, upright and perpendicular and horizontal openings.

Q. Then the opinion which you have expressed respecting the
spark-arrestors made of cast iron and those made of wire net-
405 ting is not made from any practical experience you have had
with such spark-arrestors?

A. Only from my idea of the wire in the shape that it is in. I know that these small pieces of iron will burn out more rapidly than the larger pieces.

Francis Kearney (the complainant), being duly sworn according to law, testified as follows:

Direct examination (by Mr. Harris):

Q. You are one of the complainants in this case, are you not?

A. Yes, sir.

Q. What is your age?

A. I think I am 59 years past; sixty the 14th day of April next.

Q. Where are you at present employed and at what occupation?

A. I am employed by the Pennsylvania railroad on the Hackensack meadows. I am round-house foreman at night or night round-house foreman, whichever you may term it.

406 Q. How long have you been in your present position?

A. I have been there 14 years the 19th day of last March, I think.

Q. As such foreman, are you familiar with the construction and use of locomotives?

A. Yes, sir.

Q. What spark-arrester is in general use upon the locomotives that come under your care and inspection in the Pennsylvania Railroad round-house?

A. At the present time they use a netting running from about the top row of flues, flat out aways, and then sloped to the top of the smoke-arch, a long exhaust pipe projecting through the flat part of the netting, with the blower pipe and air-pump exhaust connected with it to pass up through the netting.

Q. Is the smoke-arch of the usual size or what is known as an extended smoke-arch?

A. It is the extended smoke-arch.

Q. This wire netting is in the upper part of the smoke-arch and does not come near the bottom, does it?

A. No, sir. I should think (I never have made any accurate measurements) about two-thirds of the way up from the bottom.

Q. From the bottom?

407 A. Yes, sir; probably more than that.

Q. In these engines what becomes of the coal and cinders drawn through the tube which does not go through the netting?

A. It lies in the extension until knocked out over the pit at the end of a trip, or half way, or wherever it may be necessary to get it out.

Q. Is there an opening in the bottom of the smoke-arch to drop these coals and cinders out?

A. Yes, sir; there is a pipe goes from the bottom of the smoke-arch down through the front of the truck, below the axles, so as to deliver it into the pit, with a close cap on the bottom end of this pipe to prevent any air from entering the smoke-box.

Q. At what time are coals drawn through the tubes of the boiler from the fire?

A. When the engine is working at its best, starting the train, on the start, or, if well loaded, generally along the road. If it is a heavy train it keeps a good grasp all the time.

Q. You mean when it is steaming——

A. I mean when they are starting the train. They have got to
drop her down to start the train. As they get it started they
408 gradually pull their lever up; they don't follow the piston
so far, and consequently do not draw the fire or cut it out so
bad.

Q. And these coals that are thus drawn out, are they live coals?

A. Live coals right from the coal-box.

Q. And from the top of the fire?

A. Yes, sir.

Q. Are they coals entirely consumed or not?

A. Well, partly consumed; in different stages.

Q. What sizes of coals are drawn through—up to what size?

A. Well, with a heavy exhaust you may find pieces as large as a walnut, of hard coal, drawn through; but soft coal is more spungy; it would look larger, but not be so heavy as hard coal.

Q. What is the diameter of the flues in an ordinary boiler?

A. Well, we have them two and a half inches.

Q. Do those coals go out as soon as they — drawn into the smoke-arch if the engine is steaming?

A. They cannot pass through unless they are broken fine enough to go through that wire netting.

Q. I mean die out.

A. No, sir; there is a continual draft and agitation from the exhaust there, or any air or any leakage that there is
409 in any part of the front end will keep them burning like a furnace.

Q. What is the effect upon the netting of these coals thus burning in the smoke-arch?

A. It will burn it out when it reaches there; but the netting is placed so high up that it does not very often reach it; but when it does it burns it out.

Q. Have you ever seen this netting burned out by the coals getting up to it?

A. Oh, yes.

Q. What did you have to do then?

A. Put a new patch on or replace it if the piece is too badly damaged.

Q. Is it often the case that you have seen live coals thus burning in the smoke-arch of the locomotive?

A. Yes, sir; as often as to every engine that comes in at night. We take none in but has live fire in the smoke-arch, in the extension.

(By Mr. McCallum:)

Q. Do you say every engine that comes in has live fire in the smoke-arch?

A. Yes, sir; more or less. Some's it is red hot; it will pour right out like—as red as anything you ever saw burning.

410 Further direct:

Q. Are those coals drawn out when the engine first comes in?

A. When she first comes into the pit that is the first thing to attend to.

Q. Before she goes in the round-house?

A. Yes, sir; to slack down the cap on the bottom of the spout and put their pokers in two peep-holes on either side. They do that and work that right down until they work it right out. They do not like to open the front at first because of a draft, but there are peep-holes there, with a little chain and cap, along the side where they put in a poker to run that out.

Q. Are the coals thus let out of the locomotive to a large extent live coals?

A. All burning; some is very fine, but all a red mass. Some will lay there and burn so that you will have to put the hose on them and put them out.

Q. After they have dropped out?

A. Yes, sir; wet them down in the pit.

Q. Before you were employed by the Penn. R. R. where were you employed?

A. In railroading on the D., L. & W., called the Morris & Essex at that time.

411 Q. About what time were you employed on that?

A. I was on the M. & E. division for about five years and left there to go to the island of Cuba to put up machinery in a sugar refinery.

Q. Can you tell us about the time you left the M. & E. railroad with reference to Mr. Lewis coming there as master mechanic?

A. Mr. Lewis came there after I had come back the second time from the island of Cuba.

Q. I mean when you last left the employ.

A. I think Mr. Lewis was master mechanic probably—to the best of my recollection, it might be 18 months—15 or 18 months—as master mechanic on the road before I left.

Q. You are one of the patentees of what is called in this case the Kearney & Tronson patent?

A. Yes, sir.

Q. And were you familiar with the use of your spark-arrester on some of the locomotives on the M. & E. R. R.?

A. Yes, sir.

Q. Do you know on about how many locomotives it was put?

A. I think it was on—well, I could name them over.

Q. Just tell us the number.

A. Six or seven; probably more, but I do not remember.

Q. You remember six or seven?

A. Yes, sir.

412 Q. By name?

A. Yes, sir.

Q. Do you know whether or not when this spark-arrester was used on these locomotives hot coals would be held and stopped in the smoke-arch?

A. Yes, sir.

Q. Do you ever remember seeing burning coals in the locomotive when that was being used?

A. Oh, yes; I have seen hot coals there.

Q. Would they burn in the same way as you have described in reference to the Penn. R. R. engines?

A. No. I do not remember seeing any that we had it on, with the exception of one, a bar being defaced, but the pieces——

Q. I am asking you whether, with the use of this arrester, there were hot coals in the front, not as to the effect of it. Do you say you never remember seeing hot coals in one, or only remember seeing the bar——

A. Oh, we used to have hot coals there. We used to clean it out in the front. Some ran up to the seventh bar there.

Q. With coal?

A. Yes, sir; as soon as they came in we used to clean it out from the front door.

413 Q. Have you ever seen, when you opened the front door, those coals red and alive?

A. Yes, sir.

Q. What was the effect of these hot coals upon the cast grating that was used, generally?

A. I have seen the gratings warm—what we would call a cherry red—from the heat, running hard and shut off and opened. You could see that in the dark; if it was daylight you could not see it; you would see what you might call a cherry red.

Q. That is, with the cast grate?

A. Yes. sir; warm.

Q. In the locomotives in which this was used do you remember whether these hot coals burned out the grating?

A. I do not remember of any being burned out not to make an opening in the bars. I saw one defaced, as I was going to tell you, by a large piece of coal, almost too large to have come through the flues, and I thought probably it was an experiment that some one had tried; that they had taken a piece of coal and put it in that grating to see if the draft would burn it out. That was the conclusion I came to, for it could not have come through the flue, the piece was too large. In that instance I saw a bar defaced.

414 Q. About what time were these gratings used on the M. & E. engines?

A. I could not give you the dates of that, but I know between the whole of them it was a couple of years between the last and the first—something like that.

Q. Then with these five or six engines you think the grates were used, on an average, a couple of years or more on each one?

A. I could not exactly say the length of time, but to the best of my knowledge between 18 months and two years—somewhere along there—they had them on. I know they put it on one and the engine went back to the shop, but I cannot tell how long she was out. She generally ran a year or over that.

Q. Do you know whether or not any of these gratings were renewed and new ones put in on these several engines of the M. & E. road?

A. No; I think not. I furnished the castings for these engines. I had the ordering of them at the factory, and I do not remember any of them being renewed.

Q. In any experiments you have ever tried have you ascertained the difference between wrought iron and cast iron to withstand the heat from live coals?

Objected to as immaterial.

415 A. At the heat which is generally in the smoke-arch, caused by these live coals, I think the cast iron will stand the longer.

Q. My question was whether you have ever in your experiments tried wrought-iron and cast-iron bars, one after the other, in the same place.

A. Yes, sir; I have tried wrought iron, cast iron, and netting similar to that exhibit of wire netting. They would not stand the heat. This netting only lasted about 8 hours before the whole centre was burned out—that is, in the combustion chamber, in front of the smoke-box.

Q. In front of the flues?

A. In front of the flues, but in from the smoke-box; right in front of the flues, where the heat of the furnace is right onto it; but there is a space about that distance from the fire.

Q. A space of about 18 inches?

A. Yes, sir; about 18 inches from the fire. They call it generally the combustion chamber, where the gas is burned before it goes through the flues.

Q. You tried wire netting like this there?

A. Yes, sir.

Q. How long did it last?

A. About 5 hours; 5 or 7 hours; I won't be sure; it was all burned out.

416 Q. What else did you try?

A. I tried wrought-iron bars half an inch face.

Q. How long did they last?

A. They stood about—well, about 18 hours. They became all warped and twisted every which way, and the centres scaled and eat down to about half the size, chipped off and burned.

Q. What else did you try?

A. I tried cast iron, one-inch face.

Q. With what space between them?

A. Three-eighths of an inch and an inch and a quarter deep, running back.

Q. How long did they last?

A. They stood about the best that they had. They stood about as long and a half as the wrought iron did. I think they stood about three days altogether, and they became warped also, not as bad as the wrought iron or not so badly burned. They had cracked.

Q. Are you familiar with diamond stacks, cone, and netting on locomotives?

A. Yes, sir.

Q. Were they in use on the other engines of the M. & E. R. R. when you were with them?

417 Mr. McCallum: I reserve the right to object to all this line of examination.

A. Yes; hardly anything else except what they called the large top stack, which was about 4 feet across, I think, the top of it, with a cone and netting. It was then called the large stack; it was built by Mr. Radley.

Q. And in those forms of stack, where were the sparks or coals arrested or stopped?

A. In the top of the stack, just below the net. The cone went down, spreading the sparks and breaking the force of the exhaust; it threw them against the netting, against the side at that angle which the coal would throw them, around on the net—sometimes on the side of the stack. Sometimes the cone would become deranged, the nuts which held it on the three standards to keep it straight over the exhaust below would become less, the cone would come out of its place and turn over, and sometimes the standard would break off, and then the full force would come against the wire netting.

Q. What would be the effect of it then?

A. Then it would cut it out very rapidly.

Q. How long, with the ordinary use of a locomotive, would the netting in this diamond stack stand it before giving out?

A. Well, there we would have to make a difference. We
418 will take on an engine running her full train and running
her full distance daily, those stacks always had to be examined
when they came in, every trip. You might find them good going out, and they would have to be repaired and a patch put on when they came back again, sometimes; but I could not say exactly as to how long they would run, but I know there is more or less repairs, and a man kept for that purpose all the time, with patches and wire to sew the patches in the stack, with a ladder to inspect them on arrival.

Q. Do you remember how frequently they would have put in a new wire netting?

A. Well, they generally put a new wire netting in when it becomes cut or too much patched in the stack; then the draft is spoiled and returns a back draft into the fire-box. When the netting is placed so many pieces on top of one another by patching, it becomes a detriment, so that you get a back draft back to the fire-box, and your engine does not work as well. One course of netting is the best, if you could keep it always so, but they have to patch it from time to time.

Q. Was such netting as Defendant's Exhibit Wire Netting used in those diamond stacks?

A. Yes, sir; used in the diamond stacks and the large
419 stacks. They had different meshes. There might be some
a little coarser than this, although not a great deal. I think
there was some a little larger than this in the very large stacks—four and a half feet or four feet top.

Q. Did they usually use such a net as that?

A. Such a net as that.

Counsel for the defendant objects to so much of the testimony of this witness as relates to the diamond stack and the comparison between wrought iron and cast iron as irrelevant and immaterial to the issue.

Cross-examination (*de bene esse*) by Mr. McCLELLAN:

Q. You are one of the complainants in this suit and also one of the inventors of the patented spark-arrester in issue?

A. Yes, sir.

Q. Leaving the Lehigh Valley railroad out of consideration, do you know of any railroad company that is using your invention?

A. No; not for a certainty, I do not.

Q. The patent has expired, has it not?

A. Not yet.

420 Q. Do you mean to say that you do not know the patent
has expired?

A. I do not think it has.

Mr. Harris: I object to this as immaterial.

Q. Are you under the impression that the said patent, originally granted April 11th, 1871, and reissued December 10, 1872, No. 5184, covered the use of a grating made of cast iron?

A. I am.

Q. I show you a copy of said patent (handing printed copy to witness) and ask you to read the same and point out or quote anything in it which shows or indicates the use of a cast-iron screen.

A. The word "grating."

"At the bottom of the 20-foot pipe, which is commonly called the bottom of the smoke-box and commonly termed the petticoat pipe B, is a grating placed at the lower part of the petticoat pipe to prevent any cinders or sparks passing into the same. F is a netting or grating placed around the top of the petticoat pipe, so as to cover the angular opening caused by the difference in size of the upper part of the petticoat pipe and the bottom of the smoke-stack."

421 Q. I asked you if there was anything to indicate that the grating was made of cast iron?

A. "Grating" is all.

Q. Do you mean to be understood that you understand the word "grating" to mean that it is made of cast iron?

A. Yes; I understand that we made a grating of cast iron.

Q. Might not the grating be made of iron bars set at intervals apart and yet not be a cast-iron grating?

A. Well, if such had been done we would not have priority. There could be bars put up and down, certainly.

Q. Is not the grating described in your patent as "constructed of straight vertical bars of iron placed at small distances apart"? I refer to the grating D, at the foot of the spark or petticoat pipe.

Mr. Harris: Objected to as immaterial to this inquiry.

A. Yes; certainly.

Q. What I want to know is this: Is there anything in the specification of the patent which shows that the grating is to be made of cast iron?

A. I do not see anything there.

Q. Look at the drawing of patent D and state as a mechanic if, in your opinion, such a grate as in there shown could be made of cast iron without being so fragile as to have no strength.

422 Objected to as immaterial.

A. No; it would not be impossible to do that, but that shows the opening there, showing the greater number in a small space. The idea is——

Q. What I ask you is this: As it is represented there, do you think that could be made of cast iron?

A. Oh, no; not as fine *is* that is there.

Q. And the word "cast-iron" does not occur in the specification of the patent, does it?

A. No, sir.

Q. Are you under the impression that the patent covers the use of a grating located within the spark-box without regard to the particular construction of the grating?

Objected to as immaterial and as already decided in the decree of the court on the question of infringement.

Q. Yes; I am of that opinion.

(By Mr. Harris:)

Q. Do you understand the question that your patent covers every form of grate that could be used in the smoke-arch?

A. In the form of grating as showing the upright bar and in sections. That is what we claim. We do not claim all gratings
423 or bars set up endways or any other way. We claim the
grating as shown for that purpose, cast in sections forming a circle around the exhaust pipes to stop the coals and cinders passing into the lift-pipe or petticoat pipe and to be thrown out into the air, into the doorways or grass, or anywhere where they may be thrown out. That is what we claim.

Further cross:

Q. Do you claim to be the first to put the grating in the smoke-arch—yes or no?

A. We claim to be the first to place a grate of that kind in the smoke-arch for that purpose.

Q. You claim that no one ever invented a grating located in the smoke-arch before you?

A. I do not claim that.

Q. You do not claim that?

A. I claim that there was a grating put there to regulate draft, and it was also mentioned that it might, when the engine was not in full motion, act as a very good spark-arrester. You do not want a spark-arrester when the engine is — in motion. When the engine is in motion you want the spark-arrester. A screen shoved down and shut it off, as a damper—that is Mr. Vaughan's claim, of Tippecanoe county. I am well aware of this apparatus and understand
their whole claim, but he put nothing there to arrest sparks
424 with an upright bar, as we put it in, or made in sections.
He made his with a cross-disk, as he called it, a grating—one shoved up inside of the other, worked with a ratchet and gear from the front of the locomotive.

Q. (Former question read to witness as follows: "Do you claim to be the first to put the grate in the smoke-arch—yes or no?")

A. Yes. We claim to be the first for the purpose it is put there—as a spark-arrester, not as a draft-regulator or anything like that.

Q. Are you not aware that the court held that this had been done before you did it?

A. I am not aware what the court held.

Q. I quote from the opinion of the court in the case: "Patents had been granted before this for spark-arresters in the smoke-head and surmounted by a tube extending upward into the smoke-stack."

Do you still claim that you were the first to locate a spark-arrester in the smoke-box?

A. Yes, sir; we claim that.

Complainants' counsel objects to this testimony as irrelevant upon the question now before the master.

425 Q. Then the testimony that you have given is based upon your understanding that your patent covers the use of a grating made of cast iron, and the further impression that you were the first to locate the grating in the smoke-arch?

Same objection as last stated.

A. Yes, sir.

Q. Have you ever seen a grating made of cast iron with the bars arranged horizontally instead of vertically?

A. Yes, sir.

Q. Like that shown in Exhibit C?

A. Not exactly like that. The front was flat. Is that meant to be a circle?

Q. Yes.

A. I saw them with the flat gratings, not in the circular form, flat; but I saw that form of bars.

Q. You never saw one like this?

A. Not a full one in that shape there, a circle like that; but I saw the same bar in that way.

Q. So far as the heating of the screen by the live coal in the box is concerned, would there be any difference between your vertical grating and this horizontal grating?

426 A. Well, the way I could answer that would be that the form we use is the best we found. We have tried that form of grating. I can produce one made out of brass, stopped half of the way from those bars, making a grating like that; but ours is the best form of grating we ever put in.

Q. That is for the draft?

A. For the draft and preventing the stopping up; the cross-gratings stop up.

Q. I am not talking of that, but I am supposing them to be subjected to the same heat of cinders.

A. I cannot say about that. I never looked into it in that way. I tried it for the draft and the other purposes and it did not answer. In regard to its heating or cooling qualities, I could not say anything about it.

Q. What I want to know is if, in your opinion, a grating like Exhibit C would be any more affected by the hot cinders than your cast-iron grating?

A. Well, I think, if it is my opinion, that it would.

Q. For what reason?

A. Because the draft is not in a natural form. The other is an upright, giving a long slope, if you will notice the length of the bar, where yours is crossed off, and draws the draft in that way at right angles, and the other gives a longer curve and a more natural draft.

427 If you brought hot coals against them there, they would hold them there, where on ours it would drop down. Your space is too short. Now, that is my opinion.

Q. Have you ever seen a grating like Exhibit D in use?

A. Yes. I saw one before similar to this with you, but none in an engine, that I know of.

Q. Not in an engine?

A. No, sir. That is the netting in the form of the others?

Q. Yes. You have no practical experience with wire netting except in the diamond stack and in the furnace, as you have stated?

A. In the diamond stack and in what they call the large-top stack. They thought that they could not make the tops large enough and they made some of them 4 feet across, and it was all wire netting in there, and also in those that are used in the extended smoke-arch. It is carried one width of boiler iron longer to make room for the cinders—the accumulation—that will not go through that netting, that cannot work out. Sometimes the netting becomes burned and lets a spark out, and that is just as bad, for you have to have it repaired again.

Q. What is your duty at the round-house, Pennsylvania R. R.?

A. Round-house foreman.

By Mr. Harris:

Q. That is your position. What does that position call
428 upon you to do?

A. Seeing to the repairs, the ordinary repairs, of engines, the making up of crews, and sending them out when the engines are ready; seeing to those that come in; that they are put in repairs before the time they are wanted, if possible.

Further cross:

Q. Is it your duty to examine the spark-arresters?

A. We have an inspector for that purpose.

Q. What is his name, please?

A. The one we have at present, his name is John Scott.

Q. Where does he live?

A. East Newark; I don't know the number; I know the street; but he lives in East Newark.

Q. Does he inspect the engines as they come in?

A. Yes, sir; ash-pans and smoke-stacks or spark-arresters.

Q. Who does he report to?

A. He keeps a book; enters it in his book; writes it up every morning. He signs "good" as to the repairs and marks down what repairs are done, if any, and as to what part.

Q. Have you ever seen an engine come in with a red-hot smoke-box?

A. Yes, sir.

429 Q. What proportion of them come in in that condition?

A. What proportion of them?

Q. What proportion of the engines come in in that condition?

A. Oh, well, we have it frequently; the front most generally—

the cast-iron door. Of late they have been running them with fire-clay and a blank piece of cast iron, which goes half way up, so as to make it more secure, but the front generally now is what gives out or the sides. When it banks up above this lining it draws the fronts and rivets away from the ring in front there. I could not say as to what number. I have seen them frequently come in with the doors cracked and had to take them out and put new doors on and had to lay them up for patching and boiler-work and had to lay them up to cut half of the circle out at the bottom—the part where the cinders lay. You will see them almost any day you come down to the round-house—two or three burned away, so that we have to cut the front out for a new piece.

Q. Do you think the sparks would burn in the smoke-box if there was no air got in through cracks or loose joints?

A. They will burn somewhat, but not as much as if there is a
draft in the front part, the air coming in. They will burn
430 to a certain extent with the agitation of the exhaust.

Q. Is not the effect of the exhaust to create a partial vacuum in the smoke-box?

A. Yes, sir.

Q. Is not the effect of a vacuum to extinguish all fire?

A. It is the effect of the vacuum to make the fire burn more bright in the smoke-box. Without that you would not have any fire; you would not have any steam, the draft, I mean, making a vacuum through the flues there—drawing the heat and air through the flues.

Q. You do not mean that it makes the fire burn brighter in the smoke-box, do you?

A. Fire-box. Well, it also keeps that alive to some extent. If there is any opening it has a better effect than that. If you get it from the bottom or around the centre, where the door is cracked, it has a better effect, for it blows the fire continually.

Mr. Harris: I offer in evidence the record, testimony, exhibits, &c., taken in the main case—in the inquiry before the master.

Complainant- rests *his* testimony, except that *he* reserves the
right to call witnesses from other divisions of the road than
431 the eastern division to show that the same arresters were
used there, thus increasing the number used by the company.

Counsel for the defendant objects to the whole of the testimony taken by the complainant- on this accounting, on the ground that it is irrelevant and immaterial to the issue presented by the court to the master. As he understands said issue, the question to be determined is what advantage, if any, has the defendant derived from the use of screens made of vertical bars with vertical openings between them as contradistinguished from screens having differently formed openings, such as are shown by the patent exhibits in the case and referred to in the opinion of the court; that the location of the screen in the smoke-box or its construction of cast iron or any other metal had nothing to do with the case.

Adjourned *sine die*.

432 United States Circuit Court.

FRANCIS KEARNEY *et al.*
vs.
THE LEHIGH VALLEY RAILROAD CO.

Report of master's sessions held at the office of the Baldwin locomotive works, at the corner of Board and Spring Garden streets, in the city of Philadelphia, on Thursday, the 21st day of March, A. D. 1889.

Present: Hon. S. D. Oliphant, the master before whom the hearing is had; Elwood C. Harris, Esq., counsel for complainant-; Andrew McCallum, Esq., counsel for defendant.

The testimony is taken in short-hand, subject to the agreement heretofore made, appearing on record.

WILLIAM P. HENSZEY, produced on the part of the defendant, being conscientiously scrupulous of taking an oath, being duly affirmed, testified as follows:

Direct examination (by Mr. MCCALLUM):

Q. Please state your business and how long you have been in it.

A. Mechanical engineer, and have been connected with the

433 Baldwin locomotive works for thirty years.

Q. Are you familiar with the construction of locomotive engines, particularly with respect to the smoke-box, spark-arrester, and stacks?

A. Yes, sir.

Q. Please stated how long, within your knowledge, the straight stacks have been used.

A. We have used them, within my knowledge—that is, as long as I have been connected with this concern—since 1860. I have been here thirty years. I came here in 1859, but I don't remember using any in 1859; but in 1860 we did use them. Of that I am positive.

Q. State, if you recollect, when you first used spark-arresting devices located in the smoke stack or box.

A. In that same year when we used the straight stacks.

Q. Were the two used in connection—that is, the spark-arrester in the smoke-arch and the straight stack?

A. Yes, sir.

Q. How were the spark-arresters then constructed and located in the smoke-box?

A. If you will give me a slip of paper I will sketch and show you how we use them. (Witness made a sketch.) They were made substantially as shown in this sketch.

The sketch made by the witness is offered in evidence and marked "William P. Henszey's sketch."

434 Q. What was the grating in the smoke-arch made of?

A. A wire netting.

Q. Please look at Defendant's Exhibit B and state if it is the same as that.

A. Yes, sir; substantially the same. Of course, as I say, it is a little different in details. For instance, instead of having a crown, as this has here, this netting runs all the way up, and was fastened to the smoke-arch and fastened around the exhaust pipe at the lower end. The lower end was fastened around the exhaust pipe, and the top was fastened to the smoke-arch.

Q. While in Exhibit D the top is fastened to what?

A. To a plate or pipe. I can't say what that is, but there is something there; it does not go all the way up to the smoke-arch.

Q. Have you any record of locomotives built with smoke-stacks and spark-arrestors like what you have testified to?

A. Yes, sir.

Q. Please produce the same.

A. This book which I produce is the book of original drawings of these stacks. There is one that was made in 1860; that has a heater combined with it; but still, practically, the smoke-stack is there. This is a straight stack here; here was a casting; this line shows the boiler, the smoke-arch. On the top of that was a
435 cast plate, on which was the boiler pipe for hot water; that
has no bearing on this; then above that was the straight smoke-stack; this was wire netting, and the exhaust pipe entered that bottom plate, and this was the spark-arrester, and the smoke-stack was a straight stack set on the top of that; that was made for the Mine Hill railroad, June, 1860, engine- No. 29 and 30; this is the record of it; this was made by me at that time; this — my writing and my drawing.

(By Mr. HARRIS:)

Q. What date?

A. June, 1860; it don't give the date. I can tell when the engines were delivered. The date in here is the date in which the engines are put under steam at our shop, and generally about two weeks after that the engine is sent out on the road. We try every locomotive in the shop under steam, and this record always gives the date of the trial in the shop; then, on September 26th, 1860, No. 29 was tried.

Now, No. 30 was — Oct. 26th, 1860; these are the two engines that had this device on. Now, that arrangement had been used for some years on the Lehigh Valley road, and this heating apparatus is the subject of a patent by R. A. Wilder. You can get a sketch of his patent at the Patent Office. His patent was for the heating of the water, and he put in this device.

(Further direct:)

Q. Where did the nozzle come?

A. Here, through the bottom here.

436 Q. At the bottom of the netting?

A. Yes, sir. Here is the device that I spoke of in the sketch. This is the same as my sketch, only it is larger in the book.

There is the drawing. This stack was put on these two engines before 1861, 8th and 9th engines. One of those engines went on the Pennsylvania railroad and the other engine—they are engines 8 and 9. No. 9 was the engine Nescopec, built for the Lehigh Valley Coal and Navigation Co. and tried Mar. 9th, 1861, here in the shop. The other engine was built for the Pennsylvania railroad and was tried Mar. 18th, 1861. Those are the two engines referred to by that memorandum. That had wire netting there and had a door there, the same as Mr. Kinsey shows. There was a hinge placed in the netting to make a door, and on the inside was placed a petticoat pipe, and that was made large enough in diameter to place petticoat pipes inside. I wish to correct something that I said. Where I said that we commenced using this in 1860 I think that had better be made 1861. I find this is dated 1861. I thought they were 1860, but I find upon referring to this book that that had better be 1861 instead of 1860.

Q. These drawings showing the 8th and 9th engines show a straight smoke-stack and grating in the smoke-arch and a petticoat pipe in the smoke-arch. Is that correct?

A. Yes, sir.

(By Mr. HARRIS:)

437 Q. It is not connected with the petticoat? The petticoat is not connected with the netting?

A. Yes, sir; not connected with the netting. The object of this and making it so big in diameter is to present all the surface we can for the smoke to pass through, to give the least obstruction possible.

(Further direct:)

Q. Is there any opening through the petticoat pipe up here?

A. There is through there—these are just washers—but not here. This is closed up. The opening is through there and through here.

Q. Have you ever used grating in the smoke-arch made of cast iron?

A. I don't remember that we ever have.

Q. What is your experience with respect to the burning of the sparks in the smoke-arch, if any?

A. The sparks only burn in the smoke-arch when the door is defective and admits air. You can't burn them unless you get air to them. It is just as necessary to have air as it is to have coal, and if the smoke-arch door is perfectly tight we find there is no danger of fire in the smoke-arch. It is only when the door is defective or some leak will admit air in there; then there is danger of catching fire and burning. For that very reason we take extra precaution in these extended smoke-arches that have larger doors; we take great pains to make them tight.

438 Q. You take pains to have the door made tight?

A. Yes, sir; we put double the number of hinges on the extended smoke-arch, on the door, to make it air-tight, where the sparks are supposed to accumulate, more than any other.

Q. Is it true that the draft coming through the flue of the locomotive from the furnace would have the effect of burning the sparks in the smoke-box?

A. I don't think it could. The oxigen has all been consumed in passing through the fire, and there would not be oxigen enough in that to sustain combustion; it wants the fresh air.

Q. What is your experience as to the durability of cast iron as compared with wrought iron to sustain the heats?

A. I should think, on general principle, that wrought iron would stand the heat better than cast iron—that is, cast iron will crack. Wrought iron may twist a little out of shape, but will remain without a break; excessive heat will crack the casting.

Q. What, in your opinion, would be the effect of fire in the smoke-arch upon a wire-netting screen like Defendant's Exhibit D?

A. I should think that the worst that could happen to it would be its twisting somewhat out of shape, but not in any way detrimental to its acting as a screen. For instance, you take a cylinder like that, a netting arch of any metal, you could press it out of
shape. (Witness illustrated with a roll of paper.) You
439 take a wrought iron or a piece of netting, anything that is
mal-eable as that would be, you may twist it or press it out of shape without damaging its surface in the least. You could press that into almost any shape, and you would still have the same amount of metal. If it were of casting the liability would be that it would crack, and it might open; the opening might be larger or smaller; it might crack so that a piece would drop out. It might start at one point and go two or three different ways and the piece drop out, but you could not do that with netting or perforated piece of iron because it would drop out. You could twist it that way.

Q. How about the fastenings?

A. That would depend upon the top and bottom fastenings being secure. We always put a piece of angle iron on the bottom and top, fastening to the smoke-arch. At the lower end there was a fringe which went around the exhaust pipe, to which this was fastened.

Q. So that if it is securely fastened at the top or bottom, it is immaterial about the exact shape?

A. Yes; it may get into that shape (crumpling the paper) and still would act as a spark-arrester.

Q. Compare Exhibit B with Exhibit D—one representing a screen of wire netting and the other of cast metal—and state which, in your opinion, is best adapted for the purpose.

A. I should not give preference to either one over the
440 other unless it might be from an accident; where a fire was to
occur in the front end, then I should think that the casting would be more liable to give trouble than the netting. I don't think we were ever called upon to put cast iron in the smoke-stack. If we have been, it has been a very exceptional case that I don't remember.

Q. Have you any knowledge of what is known as the Smith spark-arrester?

A. Yes, sir; we have used them.

Q. (Witness is shown a copy of Smith patent- No. 106,515 and 112,506.) Please state if these patents present the Smith spark-arrester.

A. Yes, sir; I know both. This one I do not.

Q. Which one do you mean?

A. We have used patent No. 106,515 and we have also used this other device, 112,506. This device shown by figure No. 1 we have used and also 106,515. Those two we have used; that is similar to this 106.515, that drawing which I now produce.

Q. What is the date of that?

A. Twelfth month, 15th day, 1870. (Witness produced a drawing.) I think we have some older ones of the Smith patent. 1870 seems to be about the first time that we have used the device of Smith.

Q. When did you first begin to make use of the Smith*s* patent?

A. As near as I can remember, in 1870.

441 Q. How was the screen in the smoke-arch made?

A. The screen was made of—I can't say now—yes; it was iron with holes—perforated plate iron punched full of holes, and these holes have sometimes been round and sometimes oblong in sections.

Q. By oblong what do you mean?

A. Say, three-eighths of an inch by one and a quarter—the size of the openings.

Q. Were they longer vertically or laterally?

A. Vertically. The reason I can't say as to these holes was that we always bought those of Smith himself. He furnished them. He had a appliance for punching them, and some has round holes and some oblong holes. That is the reason I can't tell the size; but as near as I can remember, it was $\frac{3}{8}$ by $1\frac{1}{4}$ ins.

Q. Do you mean holes like the opening in Exhibit B—oblong holes?

A. Yes, sir.

Mr. Harris: I desire to object to this line of testimony, as the question has already been passed upon by the court as to the complainants' patent being a valid patent as against the patent of Smith, and the testimony on that point is irrelevant in the present inquiry.

Q. That is all.

442 Mr. McCallum: The object of this testimony is to show that these spark-arresters were used in the smoke-stack before the patent in question.

Cross-examination (by Mr. HARRIS):

Q. Do you know whether James Smith has continued the owner of these two patents that have just been mentioned after the time you were manufacturing?

A. No; I don't know.

Q. In what year after 1870 did you manufacture locomotives and obtain these screens from Mr. Smith?

A. That would be a very hard question for me to answer, but all the locomotives we built for the Pennsylvania railroad from time to time were built and used the Smith stack up to within a few years, when they changed to the extended smoke-arch, and we never made one of those plates. I say we obtained those from Mr. Smith. I am not sure that they were not made at Altoona and sent to us by the Penna. Railroad Co., but they were never made by us. I don't know whether Mr. Smith was in the business or not.

Q. Was Mr. Smith connected with the Pennsylvania railroad?

A. That I can't answer. I don't know whether he was or not. I never saw him.

443 Q. Did you put the Smith patent in any locomotive except for the Pennsylvania Railroad Company?

A. Yes, sir; our books show that.

Q. When you obtained the plate from Mr. Smith?

A. Yes, sir; we never made any of those plates ourselves. We obtained them from outsiders.

Q. Have the Baldwin locomotive works ever had any interest in that patent?

A. None whatever.

Q. Have you ever been a locomotive engineer?

A. No, sir.

Q. Have you ever had any practical experience in running locomotives?

A. I can't answer that yes or no. I have run locomotives, but never continuously. I have run them in the nature of my business.

Q. Have you ever run them long enough with any of those arresters you have mentioned this morning to know from your personal knowledge the working of them?

A. No.

Q. Do you know how long the arresters placed in the three locomotives you have mentioned as having been made about 1860 or 1861 were used in those locomotives?

A. No.

Q. You know nothing of their history after leaving the shop?

A. No; sir; they passed out of our control entirely.

Q. They were locomotives you made to order?

444 A. Yes, sir; we put this device in and sent them on the road. They were accepted and paid for, and there we lose sight of them, but there were a great many more than those three which I have spoken of that were made in this way. I only speak of those as being along the beginning of the time when we

made them, and we continued making these, more or less. I can't tell without a great deal of research.

Q. Do you consider that the arrestors as shown in the drawing that you made called "Henszey's sketch" as substantially the same grating as the Smith patent?

A. The arrangement was so entirely different from the Smith; it was not at all like the Smith patent.

Q. Does it not consist of a grating or netting surrounding the exhaust noz-*el* and extending up to the top of the smoke-arch?

A. Yes, sir; so far it does.

Q. And does not the devi*de* for arresting sparks in the Smith patent consist of the same thing?

A. Yes.

Q. That also has a surround casting outside?

A. Yes, sir; this has not, you see.

Q. But the wire netting is what stops the sparks in both cases?

A. Yes, sir; it is the wire netting that does that.

Q. You may turn to the drawing which you first showed us for the Mine Hill railroad and state upon what scale this drawing was made?

A. Two inches to the foot.

445 Q. Will you state what the diameter of the smoke-arch is?

A. About four inches in diameter.

Q. Will you state how far down the smoke-arch the wire netting extends from the top?

A. 10 and a half inches.

Q. Then the lowest point it reaches in the smoke-arch is this drawing you have presented was about three feet above the bottom of the arch, thirty-six inches?

A. Yes, sir; above the bottom of the arch of this, but it is not necessary that the smoke-arch should be round. This is really a continuation of the smoke-arch up here.

Q. But the smoke-arch follows the outline of the boiler?

A. Except in a case like this.

Q. As to the circular part?

A. Yes, sir; of course that follows the shape of the boiler.

Q. Where would the coal stopped by the netting in this drawing of the Mine Hili railroad engine fall?

A. To a receptacle that was placed below the smoke-arch. There was a receptacle below the smoke-arch between the cylinder through which the sparks were carried. They were supposed to drop down.

Q. Then there was no danger in this device of the coal filling up to the netting unless they fell way up by the flues?

A. No.

446 Q. You may now turn to the other drawing of the eighth and nine-, the engines for the Lehigh Coal and Navigation Co.

A. One was the Lehigh Coal and Navigation Co.; one was the Pennsylvania Railroad Co. One was for the Pennsylvania Railroad Company and one for the Lehigh Coal and Navigation Company.

Q. In this device the wire netting was not attached to the petticoat pipe?

A. No.

Q. And that drawing shows the downward extension of the smoke-stack for about ten inches, and then the petticoat pipe inside of this and smaller at the top?

A. Yes.

Q. So that in this device the screen is neither attached to the petticoat pipe nor to the down-ard extension of the smoke-stack?

A. No, sir.

Q. Do you know anything of the working of that device after it left the shop—those particular locomotives?

A. No; not further than that the engines were delivered to the road and were accepted by them with this device in them, which was presumed to be satisfactory.

Q. But you know nothing of the subsequent history?

A. No. We don't keep track of them after they leave here.

Q. You put in the device that the party desired?

A. Yes; in this case. I think this was a device of our
447 own—that is, they let it to us to do as we pleased.

Q. Between the time when you built these three locomotives you have mentioned, in 1860 and 1861, and the building of locomotives under the Smith patent, was a device with a wire screen with the smoke-arch adopted and used for any road for which you were building locomit-ves, as a general thing?

A. That I cannot answer. I don't know without hunting up the evidence—looking over our records. We have built so many different things. Unless you were conversant with it you would not believe that there could be so many devices used. It is hard to keep track of them.

Q. Have you ever built locomotives for the Lehigh Valley railroad?

A. A great many of them.

Q. How recently?

A. We have just sent out—I think they went since the first of the year; since the first of January.

Q. Of what is the wire screen you have spoken of made—drawn malleable wire?

A. Yes, sir; and in old times they were iron wire, and of late years they have been steel wires.

Q. How lately have they been made of steel wire?

A. I think for the last ten years we have been using steel wire; I don't know but longer. It is hard to tell when that came in.

448 Q. In a furnace for other arrangements where red-hot burning coals come in contact with iron what is usually in use, wrought iron or cast iron?

A. I think both; I should say whichever happened to come to hand.

Q. What are the fireplaces or furnaces usually made of, wrought iron or cast iron?

A. What do you mean?

Q. House furnaces, heating furnaces.

A. They are cast iron, usually.

Q. Is it not your opinion that with a piece of wire netting like I now show you the Defendant's Exhibit Wire Netting will stand for any length of time with burning coals against it?

A. No; not if you put it right in the fire.

Q. Suppose red-hot burning coals lay against that netting, it would be very quickly burned off?

A. They would burn it out.

Q. (Witness being shown Complainants' Exhibit Defendant's Grating.) Would the burning of red-hot coals against that cast grating burn that out as quickly as wire netting?

A. I don't think that they would, from the fact that there is a great deal more of it to burn. If you reduce that as thin as that is the one will burn as quickly as the other.

449 Q. Is it not true that from the various ways in which iron is made, one being a malleable and drawn and the other being cast, the cast iron is calculated to stand red-hot coal better than the wrought?

A. I think they would stand. Of the two I think that the cast iron would stand a little longer than the wrought, but of the same substances I think that the cast would go pretty nearly as soon as the wrought. I think, if there is a difference at all, it would be in favor of the cast: if the substance was just the same.

Q. Then it is possible that the cast netting would have a good deal more iron?

A. Yes, sir; certainly.

Q. That is, thickness of iron and the same extent of perforation?

A. Yes.

Q. That is, these bars of iron can be two or three times as thick as they are wide?

A. Yes, sir.

Q. While the wire is the same?

A. Yes, sir.

Q. Is it not true that it is impossible almost to exclude air from the smoke-arch of a locomotive?

A. No; I don't think so. I think if proper care is taken it can be excluded.

450 Q. What do you mean by proper care?

A. Why, if the front is put on properly and tight and the door is made to shut tight.

Q. You say that this is a point where you take extra pains and put on double the number of fastenings to the front door in order to exclude the air?

A. In order to hold the door tight.

Q. And exclude the air and keep the coal from burning?

A. Yes, sir; exactly.

Q. Is it not true that almost every locomotive will show, in the appearance of the iron on the outside, that it sometimes, if not often, becomes almost red hot from use?

A. That I can't say, because I don't observe the locomotives.

Q. Are your locomotives often brought to the shops for repairs?

A. Yes, sir; we have them here frequently for repairs.

Q. Does not the appearance of the iron—the outside appearance of the iron—the smoke-arch—by its roughness show that it has been very much hotter than the outside of the boiler back of the smoke-arch?

A. Well, one heating might show that; if it had been once in its lifetime hot, it would show that.

Q. Has not your observation been that you very often see locomotives when the outside appearance of the smoke-arch indicates that it has been red hot?

451 A. Yes, sir; I frequently see locomotives that indicate that their boxes have been hot.

Q. That only would be occasioned by burning coal inside?

A. Yes, sir; that would be the inference, that there had been a fire inside there.

Q. The inference would be that there had been red-hot coal, and not simply the flames from the boiler?

A. The flames from the boiler would not produce it. I don't think it would have any trouble from that.

Q. The coals usually that are drawn through the flues are burning coals—red hot?

A. Yes; they must be; they come right off the fire; they cannot be anything else, unless it be that when a man throws a shovel full of coal in some might go through.

Q. And that is the reason that spark-arrestors are necessary, because live coal go through there?

A. Yes, sir.

Q. Has the matter of an efficient spark-arrestor upon a locomotive been one of great importance to companies in operating their roads?

A. Yes, sir; it is generally thought so.

Q. It is so, is it not?

A. Yes, sir.

Q. And a matter of importance in manufacturing locomotives?

A. Yes, sir.

452 Q. Have you, in the manufacture of locomotives for the Lehigh Valley Railroad Company, placed on their locomotives the reservoir extending through the front platform for drawing the coal out of the smoke-arch?

A. Yes, sir.

Q. For how many?

A. I can't tell.

Q. Can you get the first drawing of that from your book?

A. I could not get the first drawing without a great deal of trouble, because I should have to hunt over all the records and find out when we first did use it. You must remember that on the Lehigh Valley they have a number of different master mechanics, and every man has his own device. When we build for one end of the road one man gives us his drawing, and when we build for the other end of the road another man gives us his drawing.

Q. You know there is now in general use on the Eastern division a wire netting like Exhibit D, defendant's netting, now shown you, with a rese-voir in front and a device for drawing the coal out of the smoke-arch?

A. Yes, sir.

Q. You have built locomotives with that device?

A. I can't say about the netting inside being just the same as this.

Q. Substantially the same?

A. Something of that kind and with the spark-box that you have spoken of in front.

453 Q. These spark-boxes have only been built in recent years, to your knowledge, like they now use?

A. Now, when you say a spark-box exactly like that—yes; but this drawing that I showed you of the Mine Hill engine had the spark-box in.

Q. Down underneath?

A. This is just the same whether you put it up there or not.

Q. Down underneath?

A. This one is down underneath. What is the difference whether it is right by or right under the smoke-box? This engine of the Mine Hill road had a spark-box underneath.

Q. It was simply a reservoir that they dropped into?

A. Yes, sir.

Q. It was a downward extension of the smoke-arch?

A. No, sir; some put it in front. We put it underneath because we had the room.

Q. Is there any room to put it there in these locomotives?

A. No, sir; therefore we put it in front.

Q. And there is a certain device to create a draft to force it into them?

A. I think there is by this arrangement of Mr. Kinsey.

Q. That arrangement of Mr. Kinsey's has been adopted within the past few years?

A. We have not built any engines for the Lehigh Valley road for the eastern end for some years until within the last six
454 *six* or eight months, and those that we did build had this arrangement on.

Q. These were the first that had this arrangement on?

A. Yes, sir. It has been 10 or 15 years since we built any for the eastern end of the Lehigh Valley road. We built for the upper end right along. I mean for a year or two.

Q. I think you said that you had never built any locomotives with a cast grating in the smoke-arch.

A. I don't remember that we have, but I see that I must qualify it from the fact that sometimes our customers send a device here to have it applied. They may have sent such a thing and I not know what the device was. At this time, 1860 and 1861, I was more in the harness and I knew everything. I made these drawings myself then and was more conversant, but since then I am not so conversant with all the details. I know generally, however, everything that is done.

Q. In the extended smoke-arch now being used by the Pennsylvania Railroad Company there is wire netting?

A. Yes, sir.

Q. Is that circular in shape, in the form of Exhibit D?

A. No, sir.

Q. It is a flat netting, inclining toward the front from above the flues?

A. Well, it does not incline towards the front; it is level generally. That is a common device in all extended smoke-arches. The Pennsylvania railroad get but a few compared to the
455 whole number.

Q. And the nozzles are long nozzles, extending nearly to the top of the smoke-arch?

A. Yes, sir; generally go through the netting.

Q. Right underneath the stack?

A. Yes, sir.

Redirect:

Q. Did you continue building locomotives with stacks and spark-arrestors like the sketch you made subsequent to 1861?

A. Only occasionally.

Q. But you did?

A. We built them; oh, yes.

Q. Many of them?

A. Not a great many with the special device.

Q. You have spoken of building locomotives for the Western division of the Lehigh Valley railroad. What sort of spark-arrestor was in them?

A. Generally the arrangement of Mr. Mitchell.

Q. Please look at the drawing shown you, marked Mitchell's spark-arrestor, and state whether that is what you refer to as the Mitchell arrangement.

A. That is only one of a number of different devices that we have used of Mr. Mitchell's. He has a number of other devices, which we have used, other than this.

456 Q. I hand you another drawing, marked "Mitchell's improved spark-arrestor."

A. Yes; that is another one which we have also used.

Q. How long have you used or constructed spark-arrestors with spark-boxes beneath the smoke-arch or in front?

A. Since about 1859, surely. The Mine Hill road were using them in 1859, when I came here. They were using it then and had been using it for several years. The Cleveland and Pittsburgh—we built a number of locomotives for that road in which the spark-arrestor was in front of the locomotive; pretty much as Mr. Kinsey's is. If I am not mistaken, they were subject to a patent of Jacob Hovey, which you can find by referring to the Patent Office. The Cleveland spark-box was in front of the smoke-arch. We also built locomotives in which the spark-box was placed back of the smoke-box along in 1861 or 1862; I can't tell which.

Q. Please look at drawings of patent No. 2143, which I show you—W. W. Hubbell, June 26th, 1841—and state if that shows such a spark-box as you have referred to.

A. This shows a spark-box in front, but not such as we have used; not located the same. The only thing is that in our case it would drop lower down, but we hadn't any of these devices—that is, the spark-arrestor which Mr. Hubbell's patent covers. That is what I refer to.

457 Q. Then, if I understand you aright, the use of the straight stack, the use of spark-arrestors in smoke-boxes, and the use of additional boxes to receive the sparks, either in front or beneath the smoke-arch, are all old and well-known devices, in use as early as 1861, to your knowledge?

A. Yes, sir.

Q. That is all.

Adjourned until March 22, at Bethlehem, Pa.

458 United States Circuit Court, District of New Jersey.

KEARNEY & TRONSON
v.
LEHIGH VALLEY RAILROAD COMPANY.

Transcript of short-hand notes of testimony taken in the above-stated cause before Hon. S. D. Oliphant, examiner, on Friday, March 22nd, 1889, at Bethlehem, Penn.

Appearances: Elwood C. Harris, Esq., for complainants; Andrew McCallum, for the defendant.

PHILLIP HOFICKER, being duly sworn, testified as follows:

Direct examination (by Mr. MCCALLUM):

Q. What is your business?

A. Machinist; employed by the Lehigh Valley Railroad Company; foreman of the shop, Beaver Meadow division.

Q. How long have you been on that division?

A. Ever since the road was consolidated with the Lehigh Valley railroad.

459 Q. About how many years ago?

A. Since the neighborhood of 1865.

Q. Are you familiar with the kind of spark-arrestor used on the locomotives on that division?

A. Yes, sir; somewhat.

Q. Please look at the drawing shown you, marked Exhibit A, and state if you have ever used a spark-arrestor like that on the Beaver Meadow division.

A. No, sir; we never did.

Q. Look at the piece of cast-metal grating I show you, marked "Complainants' Exhibit Defendant's Grating," and state if gratings of that construction were ever used on the Beaver Meadow division.

A. Not to my knowledge. No; we never used anything of that kind.

Q. Please state what kind of spark-arrestors have been used since you were on the road.

A. (Witness produces a drawing which shows what they have been using on said division.)

Q. Figure 1 of the drawing shows the Mitchell patent?

A. Yes, sir.

Q. And the figure 2 the Kinsey?

A. Yes, sir; with the wire netting.

Q. Will you please state when you used this spark-arrestor?

460 A. I have not got any date when we first commenced using them, but I suppose it is five or six years, and the other I suppose about two years.

Q. Did you use any before that?

A. We did use some, different kinds. There were some ribs in front of the flues to break the sparks going up, and we used an old wooden stack with a netting on top.

Q. Since you commenced using these spark-arrestors showing by the drawing have you had any trouble with them burning out?

A. No, sir.

Q. Have you had to renew the netting any?

A. Sometimes the netting would get cut out with the cinders coming through the flues. We have had very little trouble with either of them.

Said drawing offered in evidence and marked Defendant's Exhibit Hoficker.

Q. You have never known them to burn out?

A. No, sir.

Q. And you think the Mitchell has been used four or five years?

A. Yes, sir; on our division.

Cross-examination (by Mr. HARRIS):

Q. In figure 1 the netting does not extend down from the top of the smoke-arch quite half way?

A. No; I think not.

461 Q. What do those black lines below the point where the netting ends indicate?

A. They show the sheet-iron casing.

Q. What became of the cinders and sparks in using figure 1?

A. Well, they have a kind of a plate underneath, and a great deal gets fine and passes through the *seive*, and we have a box we let the sparks in.

Q. Below the boiler?

A. Yes, sir; outside.

Q. In front?

A. Yes, sir.

Q. When you have used No. 2 you have had these boxes take the coals out?

A. Yes, sir.

Q. Have you ever used No. 2, the Kinsey, without having boxes?

A. No; I think not.

Q. You have never used any cast gratings of any form in the smoke-arch?

A. No, sir; not of that description.

Q. Or of any other description?

A. No, sir.

David Clark, being duly sworn, testified as follows:

Direct examination (by Mr. McCullum):

Q. Please state what your occupation is and how long you
462 have been engaged in it.

A. Master mechanic of the Lehigh Valley railroad at Hazleton. I went there in 1855 and have been there ever since; not all the time for the Lehigh Valley railroad. Up to 1868 the road was owned and controlled by A. Pardee & Co., coal operators.

Q. Please look at the blue print now shown you, marked Defendant's Exhibit A, and state if you ever used a spark-arrestor on the locomotives of the Hazleton division constructed as shown by that drawing.

A. No, sir; I never did.

Q. Look at the fragment of grating shown you, marked Complainants' Exhibit Defendant's Grating, and state if you ever used on that division a grating like that in the smoke-box of a locomotive.

A. No, sir; I never did.

Q. Prior to the year 1871 what kind of a spark-arrestor was used on the Hazleton division?

A. We did not use any; open stack without any spark-arrestor.

Q. Since 1871 what have you used, if any?

A. Within the last several years we have been using something on the principle of Mr. Mitchell's patent.

Q. Have you a drawing of it?

A. (Witness produces drawing showing the construction of a spark-arrestor now used on the road, the dotted lines on said
463 drawing indicating a screen of boiler plate with holes of a square or rectangular form. Some are punched with round holes and some with square.)

Q. When did you first begin to use these?

A. I cannot tell; this drawing is dated 1883; I think we used them earlier than that, but not a great deal.

Said drawing offered in evidence and marked Defendant's Exhibit Clark.

Q. Are the sparks retained in the box by that plate?

A. No, sir; they are ground up and finally find the*re* way out in the shape of dust.

Q. As they get through are they extinguished?

A. There is some fire left in them, but it is very small by the time it reaches the ground, and would not set anything afire.

Cross-examination (by Mr. HARRIS):

Q. Up to the present time have you used any spark-arrestor in your division except the one you have just described?

A. No, sir. Well, there was a time when we used a kind of a diamond stack, and it was made of a cast-iron grating, but we cut it out as fast as we put it in.

Q. Was this prior to the use of your present arrestor?

A. Yes, sir.

464 Q. For about how long did you use that kind of diamond stack?

A. About two years altogether.

JOHN CAMPBELL, being duly sworn, testified as follows:

Direct examination (by Mr. McCULLUM):

Q. Please state what your occupation is and how long you have been employed.

A. Master mechanic of the Mahanoy division.

Q. How long?

A. Since 1871.

Q. How long have you been in the employ of the Lehigh Valley Railroad Company?

A. That was the time, in 1871.

Q. Please look at the drawing now shown you, marked Defendant's Exhibit A, and state if you have ever used a spark-arrestor on locomotives as shown by said drawing.

A. No, sir.

Q. Please look at the fragment of cast-metal screen now shown you, marked Defendant's Exhibit Grating, and state if you have ever used gratings of that construction on the Mahanoy division.

A. No, sir.

Q. What description of spark-arrestor have you used, if any?

465 A. Mr. Mitchell's and Mr. Kinsey's and of late years an extending front with a deflection plate.

Q. How were you employed prior to your engagement with the Lehigh Valley Railroad Company?

A. As locomotive engineer, and I had charge of the shops.

Q. With what company?

A. The Lehigh Coal & Navigation Company.

Q. What is your first recollection of having used a straight stack with a spark-arrestor located in the smoke-box?

A. 1862.

Q. That was on what road?

A. Lehigh Coal & Navigation Company.

Q. Can you describe what kind of a construction it was?

A. I have a drawing made from memory.

(Witness produces drawing.)

Said drawing offered in evidence and marked Defendant's Exhibit Campbell.

Q. What is the kind of screen shown in that drawing?

A. Wire netting resting on a solid plate.

Q. What is the top of it connected with?

A. In the arch of the smoke-stack with a series of cones.

Q. What was your experience with a spark-arrestor of that construction; how long was it used?

A. Eighteen months.

466 Q. Did you find any trouble with the wire netting burning out?

A. No, sir; we never renewed it during that time. The only change I ever made was to perforate the bottom plate.

Cross-examination by Mr. Harris:

Q. What was burned in those engines?

A. Anthracite coal.

Q. What work did the engine do?

A. Hauling coal trains.

Q. Was there any spark-box attached to them?

A. No, sir.

Q. Where did the sparks go?

A. We had to shovel them out about twice a day.

Q. Did you find it was necessary to keep them shoveled out?

A. Yes, sir.

Q. Why?

A. It would block up.

Q. You had to keep them below the netting?

A. Well, we had to keep the flues clear; it would block the bottom flues.

Q. You made this drawing from memory?

A. Yes, sir.

Q. You have put on certain dimensions here?

A. I couldn't say if they are right; it is as near as I could recollect.

467 Q. What were those cones in the stack for?

A. To break the draft, so that the dirt would fall back into the box.

Q. What are the white lines drawn inside the wire netting?

A. The exhaust pipe, a lifting pipe.

Q. Then there was quite some space below this spark-arrestor in the bottom of the smoke-arch?

A. About 14 inches.

Q. And you found it necessary to keep it clear of cinders?

A. Yes, sir; I never found any fire in the front end; it was always dead.

Q. After this eighteen months did you ever use any other arrestor like this?

A. No, sir.

Q. What kind of an arrestor did you use afterwards when you were running the locomotives?

A. Just a wire netting.

Q. Mr. Mitchell's?

A. No, sir; an upright grating.

Q. Any netting about it?

A. Over the exhaust.

Q. That was here—within the smoke-arch?

A. Yes, sir; near the top of the flues.

468 Q. And that was substantially the same way of arresting sparks as the extension smoke-arch?

A. Yes, sir.

Q. And this drawing which you have made and this locomotive which you have mentioned is the only one you have run with a circular netting surrounding the exhaust?

A. Yes, sir.

Q. Were all the locomotives constructed like that at that time?

A. No, sir.

Q. Were there any others?

A. There was one, No. 2, a Baldwin engine; it was a little different design from this.

Q. That is all you remember?

A. Yes, sir.

Redirect examination:

Q. You mentioned a Baldwin engine that had a netting something like that, built by the Baldwin Locomotive Company?

A. Yes, sir.

Q. Do you remember the name of the engine?

A. I cannot think of it just at present. It is No. 2—Nescopic, that is the name.

Q. That was in 1861?

469 A. Yes, sir.

ALEXANDER MITCHELL, being duly sworn, testified as follows:

Direct examination by Mr. McCALLUM:

Q. Please state your occupation and how long you have been engaged in it.

A. I have been with the Lehigh Valley Railroad Company. I went on the Mahanoy division in 1874. That road was consolidated with the Lehigh in 1866. I remained there 7 years I was then transferred to the Wyoming division of the Lehigh Valley Railroad Company at Wilkes Barre as master mechanic, or whatever you like to call it.

Q. You are now there?

A. Still in the same position.

Q. Please look at the blue print, Defendant's Ex. A, and state if a spark-arrestor constructed the same as shown by said print has been used on the Wyoming division and on the Mahanoy division.

A. We have not applied any in that form; there has been engines on the division from Mr. Kinsey's shop with arrestors of that kind.

Q. You have never applied any?

A. No, sir; not in that form.

470 Q. Please look at the fragment of cast-metal grating marked Defendant's Ex. Grating and state if you have ever used on the Mahanoy division spark-arrestor grating of that construction.

A. I have used a cast-iron grating, not made, however, in segments, but in a circular or conical form, with slotted holes in, not as long as these. They were not constructed in that way. I think I have a drawing showing how they were constructed.

Q. You never saw them constructed like Defendant's Ex. Grating?

A. No, sir.

Q. You have a drawing showing the construction?

A. Yes, sir.

(Witness produces a drawing.)

Said drawing offered in evidence and marked Defendant's Ex. Mitchell No. 1.

Q. Please mark on this drawing the part you refer to as being made of cast iron.

A. This lower cast-iron part (witness marking it with the letter A).

Q. That is located inside of the sheet-iron pipe?

A. Yes, sir.

Q. And connected with the top of the smoke-arch by wire netting?

A. Yes, sir.

471 Q. The perforations in this casting were round and some were oblong, as I understand you?

A. Yes, sir.

Q. Can you indicate on the drawing with the red pencil the comparative length of the oblong slot? State the size of them.

A. About five-sixteenths wide by one inch and three-quarters long. They were the same width as this piece of grating, Defendant's Ex. Grating, and about half as long.

Q. When did you use a grating of that construction?

A. During the summer of 1876.

Q. How long were they continued in use?

A. But a short time.

Q. A month?

A. I don't remember the number we put in. They were probably in use but two or three months.

Q. How many was there of them?

A. Ten engines of that class, and they were furnished with that form of casting. We only put them in three or four engines.

Q. Did you use them for three or four months?

A. Yes, sir; we did not continue their use.

Q. And they were used inside of a sheet-metal casting and
472 connected with the top of the smoke-arch by a wire netting?

A. With an internal pipe, also inside the screen.

Q. There is no extension of the smoke-stack the same as Ex. A?

A. No, sir.

Q. Look at Exhibit Mitchell's Improved Spark Arrestor and state if that is the same construction.

A. Yes, sir.

Q. You have stated that ten engines were equipped with these spark-arrestors, but only three or four had this particular screen. Please explain more definitely.

A. When these engines were received from the manufacturer they had the round holes in the internal screen, as shown on the drawing. We afterwards substituted cast-iron screens with the rectangular slots, and we tried them in that way—we tried them with the short slots inside of the round holes.

Q. That was only three or four?

A. Yes, sir; to the best of my recollection. We after substituted high exhausts, with lifting pipes and screens.

Q. You mean the same as shown by drawing, Mitchell Spark Arrestor No. 3?

A. Yes, sir; we afterwards substitutod them for the cast screens.

473 Q. Have you any knowledge of what is know- as the Smith spark-arrestor?

A. Yes, sir.

Q. When did you first know of it?

A. I don't think I can give you a date. I saw it on the Pennsylvania railroad a long time ago. I cannot tell you the date; it was some time prior to 1876.

Q. What is your first knowledge of a straight stack with a spark-arrestor in the smoke-box of any kind?

A. My first recollection of a straight stack with a spark-arrestor in the smoke-box was on the Camden and Amboy road. I don't know the engine.

Q. What year was it?

A. About the year 1852 or 1853. They were in some engines designed by Mr. Dripps and constructed by Morriss Brothers, of Philadelphia. These engines had a straight stack.

Q. You refer to Mr. Isaac Dripps?

A. Yes, sir.

Q. Do you know whether he is still living?

A. Yes, sir; I think in Walnut street, Philadelphia.

Cross-examination by Mr. Harris:

Q. What are you using on your division now, Mr. Mitchell?

474 A. We are using some extended smoke-stacks with a short extension, with the spark receptacle, and we have some with that high form.

Q. Some of your own pattern?

A. Yes, sir; I am using a lifting pipe with a screen and with a slot to throw the sparks into the spark-arrestor.

Q. Is that like Mr. Kinsey's?

A. He does not use a lifting pipe; he uses part of mine. He uses my vacuum pipe.

Q. Are you using any like Defendant's Ex. D?

A. No, sir; not like that.

Q. That is the one you understand is in use now on the division for which Mr. Kinsey is master mechanic?

A. Yes, sir; I think that is something like the form of it.

SAMUEL FOLKENSON, being duly sworn, testified as follows:

Direct examination by Mr. McCALLUM:

Q. What is your business and how long have you been engaged in it?

A. Engineer, locomotive engineer. I have been running since 1875.

Q. In whose employment?

A. The Lehigh Valley railroad, under John I. Kinsey as master mechanic.

475 Q. Are you familiar with the kind of spark-arrestor they use on the locomotives they run?

A. Yes, sir; that is, my locomotives; those I run. I sometimes get on a strange one.

Q. I mean those you run.

A. Yes, sir.

Q. Please look at the photograph now shown you, Defendant's Ex. D, and state if you have ever run a locomotive with a spark-arrester like that shown by said photograph.

A. Yes, sir.

Q. State when you first used a spark-arrestor like that.

A. As near as I can tell, in the fall of 1877 or the beginning of 1878. I cannot be positive in the month, but it was very shortly after I ran the engine in 1877.

Q. What was the number of your engine?

A. 305; I ran it from 1875 to 1877.

Q. And what after?

A. 308. This is the style 308 had.

Q. 308 had the same style of spark-arrestor as the photograph?

A. Yes, sir.

Q. Was it made just as shown by the photograph?

A. Yes, sir; just exactly like that there.

Q. Was there any spark-box below the platform?

476 A. No, sir; just like it is there now.

Q. How long did you run the locomotive with that on?

A. I cannot tell just exactly how long, but we ran it quite a while before they made any change. It might be two or three years; I couldn't tell; that is as near as I can tell.

Q. Did you have any trouble with the wire netting getting out of order during that time?

A. No, sir.

Q. Was there any trouble with the smoke-box getting hot?

A. No, sir.

Q. Or the sparks lodging in the smoke-box?

A. No, sir.

Q. State if you ever had any trouble caused by the burning of the sparks in the smoke-box on any engine you have run under the Lehigh Valley railroad.

A. Do you mean such as blocking up the netting sometimes?

Q. No; from fire.

A. Not that I know of.

Q. Was that netting renewed or repaired while you had it on?

A. Not to my knowledge.

Cross-examination by Mr. HARRIS:

Q. Do you remember when it was put in this locomotive?

477 A. Not the time.

Q. Did you run this locomotive before this wire netting was put in—No. 308?

A. Yes, sir.

Q. What with?

A. *I* cone and diamond stack.

Q. Do you always know when the spark-arrestors are repaired in the locomotives you are running?

A. No, sir.

Q. You run your locomotive into the round-house and it is there inspected by parties for that purpose?

A. Yes, sir.

Q. And you take it when it comes out?

A. Yes, sir.

Q. And this may have been renewed without your knowledge, may it not?

A. If they fixed it the same way as before, I might not have noticed it, but if they had put any patches on, I should have seen it.

Q. They could have put in a new netting, could they not?

A. Yes, sir.

Q. How long, definitely, did you run this locomotive with the netting?

478 A. I couldn't give you the time.

Q. Do you remember when it was taken out?

A. No, sir.

Q. Did you run the locomotive after it was taken out?

A. Yes, sir.

Q. What did — have then?

A. A cast-iron screen.

Q. Like the exhibit lying before you on the table?

A. Yes, sir.

Q. You say you had no difficulty with these locomotives as regards the front end becoming hot?

A. No, sir.

Q. Was there a good tight door on it?

A. Yes, sir.

Q. Have you ever seen locomotives that showed by the outside that they had been very hot in front?

A. Yes, sir.

Q. Then locomotives do sometimes become hot?

A. I never saw one red hot—that is, on the Lehigh Valley road.

Q. Both these arrestors, both the netting and the cast grating, would stop the burning coal and keep it in the smoke-arch, would they not?

A. Would stop the coal and keep it in the smoke-arch?

Q. Yes.

479 A. Not all of it; the finer ones would escape.

Q. The larger ones would be kept there?

A. Yes, sir.

Q. When you ran these engines with the wire netting did you clean the smoke-arch?

A. Yes, sir.

Q. How often?

A. Sometimes once or twice a week and sometimes not for two weeks.

Q. How was it when you were using the cast grating?

A. The same way.

Q. Were you an engineer running engines during all the time you have mentioned, from 1875 to the present time?

A. Yes, sir; all but the time I was sick.

Q. What is under the locomotive you are running now?

A. I have no regular locomotive just at present. The last one I ran was 152.

Q. What did that have?

A. Wire, with a spark-box in front.

Q. Do you know how long it has had this wire, with the spark-box in front?

A. About a week.

Q. How long have they been using this spark-box in front
480 like there is on most of the locomotives now?

A. About two years or two and a half.

Q. Are you on any regular run now?

A. Not at the present time.

Q. How lately have you been?

A. Since last fall—about the beginning of December.

Q. During this time what locomotives have you been running—passenger or freight or coal?

A. Passenger and freight; very few freight engines.

Q. Do you remember when the wire netting was taken out of engine 308 and this grating substituted?

A. No, sir.

Q. You remember that it was changed?

A. Yes, sir.

Q. Why was it changed?

A. I don't know. It might have been for handiness; that is all

I can see in it. I didn't see much difference in expense. If one of these breaks it is easy to replace it; that is all I can see about it. If there was a hole on the netting you would either have to have a whole new netting or else patch it.

Q. Then it was necessary sometimes to patch the netting?

A. I suppose there was a few patched sometimes.

481 Q. Are there some of them patched that are now in use?

A. I couldn't possibly say; that is something I never looked after.

JOHN I. KINSEY recalled.

Direct examination by Mr. MCCALLUM:

Q. I would like you to give a brief history of the spark-arrestors which you have been using on your division, giving dates where you can as to the different devices used.

A. For what time back?

Q. Well, go back to 1869, say.

A. There has been some other stacks put on. The first we used was a diamond stack with a cone and screen. We then used a wire netting in the smoke-box, made in a conical shape, the same as Defendant's Ex. D. As to the dates, I can't remember exactly. I cannot just call them to mind, when those were put in and taken out. After the wire netting was used an iron grating was used with a vertical slot.

Q. Like Ex. B?

A. Yes, sir. After that the horizontal slots were used, the same as Ex. C. Then we substituted wire netting in a conical shape in the smoke-arch, three and a half mesh- to the inch.

482 Q. The same as Ex. D?

A. Yes, sir; excepting it had no door in the front. It was just put together in two halves. Then, in addition to that, we put in the spark-boxes, and that we are using at the present time.

Q. Have you any recollection as to when you first began to use wire-netting screens like Ex. D?

A. Yes, sir; in 1877 we put the wire netting in.

Q. That is, without any spark-box in front?

A. Yes, sir.

Q. When did you substitute the casting like Ex. B?

A. I can't give you the exact date of that; I think it was in the neighborhood of December, 1878.

Q. When you discarded the cast-metal gratings and went back to the netting, did you use the netting without a spark-arrestor box in front and beneath?

A. Yes, sir.

Q. For how long?

A. For several years. We have some of them yet.

Q. You say you have some engines still in use with the netting like Ex. D without a spark-box?

A. Yes, sir.

Q. How long has that been in use?

A. That has been in use probably two years; perhaps 483 longer. I have an engine here that can be seen. We have another engine with the vertical slots as well as the horizontal.

Q. When was the netting put in the engine that is here?

A. I think in 1887. The netting that is in now was put in in 1887—the fore part of 1887.

Q. And it has been in use ever since without a spark-box?

A. Yes, sir; and without renewing the netting.

Q. Do you know the number of the engine?

A. Engine 31.

Q. Do you know if that netting has been renewed or repaired during that time?

A. No, sir; that is the same netting.

Q. Did you ever have any trouble with these wire-netting screens like Ex. D, with the spark-box getting hot?

A. No, sir; I have never known them hot enough to give us any trouble.

Q. In your experience have you ever had any trouble caused by the smoke-box getting red hot?

A. No, sir; I have never seen them red hot.

Q. Have you ever had any trouble through the wire netting of these screens becoming warped?

A. Not to my knowledge; no, sir.

Q. I mean so as to make openings through which the 484 sparks could get into the smoke-stack?

A. No, sir.

Q. As compared to the cast-metal screens, how did you find the wire netting, as to durability?

A. The wire netting stands it better than the cast iron.

Q. What is your opinion as to the capacity of the wire-netting screen to withstand fire in comparison with the cast-metal screens?

A. The cast iron will melt before the wrought-iron netting will show any depreciation.

Q. How do you know that?

A. By experiment. I can show you the result of it by the heat applied to the two.

Q. You say you can show that?

A. Yes, sir.

Q. How?

A. (Witness produces a plate on which — two pieces of the grating in question, one of cast iron and the other of wire netting.) I placed them in a furnace and let them remain there until the cast iron commenced to melt; then I took them out, and this is the result of the experiment. The cast-iron grating had melted somewhat and adhered to the plate and the netting is intact and is not attached to the plate.

485 Above-mentioned plate, with pieces of grating, offered in evidence, and the same was marked Defendant's Ex. Kinsey's Experiment.

Q. When did you make that experiment?

A. I should think it was between two and three weeks ago.

Q. Is the cast iron and wire netting used in said experiment the same as you have used in the spark-arrestors in question?

A. Yes, sir.

Q. Have you made any other experiment with these spark-arrestors in order to determine which form of opening is best adapted for arresting the sparks without interfering with the draft of the locomotive?

A. Yes, sir.

Q. State what you have done.

A. The openings in the wire netting retain the sparks in the smoke-box, while the openings in the cast-iron screens allow them to pass out—that is, it will pass out in larger pieces than it will with the wire netting.

Q. Have you made any comparison with the grating with the vertical slots like Ex. B and the one with lateral slots like Ex. C?

A. Yes, sir.

486 Q. Are you prepared to show the master the result of that test?

A. Yes, sir. We have two engines here, one with the vertical openings and one with the horizontal ones.

Q. What has been the run of these engines during the last twenty-four hours?

A. A run of ninety miles with a coal train—from Easton to Mauch Chunk.

Q. Are the engines here now.

A. Yes, sir.

Q. Have the doors to the smoke-boxes been opened since they made the run?

A. Not since this morning, when they made the run.

Q. To your knowledge?

A. I told the men not to open them, and if they did open them it was contrary to orders.

The master and counsel then went down to the locomotives.

GEORGE MOIR, being duly sworn, testified as follows:

Direct examination by Mr. McCALLUM:

Q. What is the number of this engine?

A. 191.

Q. Are you the engineer of this engine, 191?

487 A. Yes, sir.

Q. Where have you been today?

A. Belvidere to Packertown and Easton and return.

Q. How many miles is that?

A. About one hundred and ten miles altogether.

Q. Has this door been opened today (indicating door in front of engine)?

A. No, sir; not today.

Mr. McCallum: Communication with the spark-box in front is shut off.

Q. Who told you to shut off this communication?
A. Nobody; it was shut off.
Q. When you pulled out?
A. Yes, sir.
Q. Has it been opened during the trip?
A. Yes, sir.
Q. How far have you been today?
A. Between 108 and 110 miles.

Cross-examination by Mr. Harris:

Q. Was this door painted all round here this morning (indicat-place on front end of boiler below the door where paint appeared to be burned off)?
A. Yes, sir.
488 Q. Then it has burned off since this morning?
A. Yes, sir; at least it looks so to me.
Q. How long have you been standing here with the engine?
A. Thirty-five minutes.
Q. Where did you come from to this place?
A. Glendon.
Q. How far is that?
A. 11 miles.
Q. With or without a load?
A. Without.
Q. How long is it since you have pulled a load?
A. Since ten minutes to three.
Q. About an hour?
A. Yes, sir.

William Coll, being duly sworn, testified as follows:

Direct examination by Mr. McCallum:

Q. What is the number of this engine?
A. 192.
Q. And you are the engineer in charge of this engine, 192?
A. Yes, sir.
Q. What run have you made today?
A. From Easton to Mauch Chunk and back to here.
Q. About how many miles?
489 A. About eighty-five or eighty-six miles.
Q. Has this smoke-box been opened?
A. Yes, sir.
Q. When?
A. At about 10.15 this forenoon. I just opened it and looked in, that is all.
Q. Was anything done to the contents?
A. No, sir.

Q. Is there any communication between the smoke-box and the front?

A. That I don't know.

Cross-examination by Mr. HARRIS:

Q. Why did you open the smoke-box?

A. I had no different orders. I had orders not to open it yesterday, but nothing was said about not opening it today.

Redirect examination:

Q. Look and see if there is any communication between the smoke-arch and the box. Is it open or shut?

A. That I do not know.

The door of smoke-box opened and screen with horizontal openings is shown.

Mr. McCALLUM: The communication with the spark-box in front is closed and the screen is clear and not choked up.

490 Engine 31.—The engineer of said engine not sworn. In response to a question put by Mr. McCallum stated that he did not know when the smoke-box was last cleaned out.

Mr. HARRIS: The meshes of the netting are mostly stopped up.

Mr. McCALLUM: Gentlemen, please note that the wire is not burned at all, and is just as good as the day it was put in.

The examination of Mr. KINSEY then resumed:

Q. Have you any record to show how long the grating which we have just seen in engine 31 has been in use?

A. Since April, 1887, up to the present time.

Q. Do you consider that that grating is in any way damaged and requires repairing?

A. No, sir.

Q. How many locomotives were fitted with these gratings be- you used this spark-box in front?

A. Before we commenced using the spark-boxes?

Q. Yes.

A. To the best of my knowledge, one hundred and thirty or forty.

Q. And on an average how long were they used before the spark-boxes were put in?

491 A. I think two years. We put them in in 1886, as near as I can recollect.

Q. During that period did you ever have any trouble with these screens burning out?

A. No, sir.

Q. Or becoming inoperative?

A. No, sir.

Q. Have you ever ascertained the degree of heat within the smoke box and stack of the locomotive?

A. Yes, sir; at the upper part of the smoke-stack it showed by the barometer 914 degrees, and at the bottom it showed 850 degrees, I think it was.

Q. How did you ascertain that?

A. By experiment with the barometer.

Q. Did you make it yourself or have anybody else do it?

A. Professor Klein, of the Lehigh University, made the experiment.

Q. Have you his report?

A. Yes, sir.

Q. Please get it.

Objected to.

(Witness produces a report made by J. F. Klein, of the Lehigh University.)

492 Above-mentioned report offered in evidence and marked Defendant's Ex. Klein's Report.

Mr. Harris: I object to that as incompetent.

Q. Is the maximum heat shown by the barometer and referred to in said report sufficient to melt iron in any form?

A. No, sir.

Q. Have you ever in your experience found the screens of the spark-arrestors in use on your division of the Lehigh Valley road melt wholly or in part by reason of the heat generated in the smoke-box?

A. No, sir.

Cross-examination by Mr. Harris:

Q. At about how many degrees of heat does iron become red?

A. I am not able to answer that question.

Q. Will the burning of coal without any blast melt iron?

A. Yes, sir; if you have good natural draft.

Q. It would require a good natural draft?

A. Yes, sir.

Q. Do you know how many degrees the furnace was in which you had this experiment, Defendant's Ex. Kinsey's Experiment?

A. No, sir; I know it was pretty hot.

Q. It would become red a good while before it would melt?

A. Yes, sir.

493 Q. Was this a piece of new wire netting when it was put in the furnace (indicating Kinsey's experiment)?

A. Yes, sir.

Q. Was it ever heated before?

A. No, sir; not since it was netting.

Q. Never since it was manufactured into netting?

A. No, sir.

Q. It has melted enough to run together some where the joints are?

A. No, sir; that is from the slag underneath.

Q. It has scaled off in places, has it not?

A. I cannot answer that question, whether it has or not. It does not appear to be any different to what it was in the shop.

Q. Any wrought iron, if heated, will form a scale and peel off, will it not?

A. Yes, sir.

Q. What is the result of constantly heating wrought iron?

A. It will scale.

Q. What is the result when cast iron is heated to a red heat?

A. I don't think I have ever seen it made red hot, only to be melted.

Q. Have you never seen the door of an ordinary furnace red hot?

494 A. Yes, sir.

Q. Have you ever seen a furnace or a stove made of wrought iron where the coals came in contact with *with* the iron without burning?

A. Well, I don't think I ever have.

Q. Have you ever seen the fire-pots of common depot stoves where the coal was right in contact with the iron?

A. Yes, sir.

Q. That is a common thing, is it not?

A. Yes, sir; where a cast-iron cylinder is used.

Q. Do you judge that cast iron will stand the heat of red-hot coals better than wrought iron will?

A. Yes, sir.

Q. Is there any question about it in your mind?

A. No, sir.

Q. In the front end of a locomotive there are coals, and if the air gets to them they will burn like a furnace, will they not?

A. Yes, sir.

Q. And it is true that there very often is a crevice through which the air penetrates?

A. No, sir; we do not allow that if we can help it.

Q. Did you not testify before that you first put in these
495 wire screens because the Pennsylvania Railroad Company
required it of you in the beginning—in the year 1886?

A. Yes, sir. Let me modify that. They limited us to a certain mesh. We used netting before and they made us conform to their mesh. They specified the mesh to the inch.

Q. You put in and used some wire screens in the same situation in the smoke-stack in 1877?

A. Yes, sir.

Q. And you took these out and replaced them with vertical screens?

A. Yes, sir.

Q. Why?

A. Because it would be cheeper.

Q. After you had had them made?

A. Yes, sir; it would be cheaper.

Q. But you took them out after you had put them in?

A. Well we put them in and then we substituted a cast-iron grating, but I don't recollect whether they were worn or not.

Q. Then you used wire screens in quite a number of the engines in 1877?

A. Yes, sir,

Q. Long enough to test it and find its advantages?

A. Yes, sir.

496 Q. Well, you threw it aside and used the cast-iron screen?

A. Yes, sir.

Q. Until this suit was brought?

A. Yes, sir.

Q. And had it in all your engines?

A. Not all.

Q. Well, in 128 out of 134?

A. Well, whatever I gave it before.

Q. Who devised the spark-box that is now on your locomotives?

Mr. McCallum: I object to this testimony.

A. Mr. Mitchell has a patent on the spark-box that is on these engines that I have fitted.

Q. And they were put in first how long ago?

A. I think during 1886 sometime, to the best of my knowledge.

Q. Did you ever use them in connection with a cast-iron grating?

A. No, sir.

Q. You have since that fitted them to about all your locomotives, have you not?

A. Very nearly.

Q. Within how many of all?

A. Well, I can't say.

Q. Very few are without it now?

A. There are some that have not got it, and yet how many

497 I can't say.

Q. And there are some that use other than the wire netting?

A. Yes, sir; with a smoke-box.

Q. Is it on all those that use the wire netting?

A. Well, I cannot tell you how many it is on. It is on the majority of them.

Q. What other locomotives do you remember, besides the one we saw this afternoon, that has a wire netting and no spark-box?

A. I can't recollect the name. We have 160 engines, and I cannot remember the numbers or names of them all.

Q. Then you put that on about the same year that you put on this mesh to correspond with the Pennsylvania railroad?

A. Yes, sir.

Q. Did you not testify before in this matter that after the complainants' suit was brought you resorted to the horizontal slots, and that you used the horizontal slots until 1886, and then you put on the wire nettings?

A. Yes, sir.

Q. And you used that from 1883 down to 1886, as a general thing?

A. Yes, sir.

Q. And then in 1886 commenced putting on the wire netting?

A. Yes, sir.

Q. And some time in the same year you commenced using
498 the spark-boxes?

A. Yes, sir.

Q. Why did you not use spark-boxes before with this cast grating?

A. Because the dirt and stuff would go out in small particles so that we did not need any spark-box. After we put in the netting we had to put in a box to take care of them.

Q. Is it not true that in these three locomotives we examined this afternoon that there was fully as much cinder in the two with gratings as the one with wire netting?

A. No, sir; two of them do heavy work and the other switches around the yard—light work only.

Q. Does 31 switch around the yard?

A. Yes, sir.

Q. And that is easier than working on the road?

A. Yes, sir. If she was working along the road she would have to be cleaned out. The cinders pass through the slots where there are cast gratings used.

Q. It would seem to be necessary when using a wire screen to have a spark-box?

A. Or else throw them out.

Q. After you took out the wire screens in 1877 and replaced them with these cast gratings, did you set fire to buildings or any-
499 thing that called the attention of the company to the fact that they were not a proper arrestor?

A. Yes, sir.

Q. But still you kept them in?

A. Well, we put in the horizontal.

Q. But not until five years after?

A. After we found out what was the next best thing we took the netting (inter-upted)——

Q. You used netting in 1877?

A. Partially.

Q. And on engines of the same form?

A. Yes, sir.

Q. And took those out and put in gratings with vertical slots?

A. Yes, sir.

Q. You introduced those from year to year?

A. Yes, sir.

Q. And had them on all your locomotives substantially when this suit was brought?

A. Yes, sir.

Q. After that you had no difficulity from fires?

A. We had fires, the same as other railroads have. After we put the wire netting in we found that it retained the coals in the smoke-box and the grating pulverised it and allowed it to pass through.

500 (By Mr. McCallum:)

Q. What was the old mesh?

A. Quarter inch.

(Recross:)

Q. Could you not have made the mesh nearer in this casting?

A. No, sir; the sand would not stay in place. The first ones used were quarter-inch mesh.

Q. Well, you used from 1878 to 1886 continuously a cast screen with this mesh?

A. Yes, sir. The openings in the mesh of "Complainants' Ex. Defendant's Grating" are a little smaller than the ones we first used.

Q. Did you have so much trouble from fire that you sought to change your arrestors?

A. Yes, sir; the wire netting was too large in the mesh—the wire we used in 1877.

Q. Why did you not put in a wire netting with a smaller mesh?

A. Because we thought we could not make steam.

Q. And so you continued to use this during this time as the most effective arrestor you could use?

A. Yes, sir; until we found out this was better.

Q. You found that out afterwards?

A. Yes, sir.

Q. Then the cause was simply that casting was better than netting?

501 A. No, sir; but the iron could be put in easier than the netting could. But the way in which we put it in now, in two pieces, with angle irons, is very simple and makes it easy to put in and take out.

Q. And, besides, the wire you used then was too large in the mesh and did not stop the coals?

A. Yes, sir.

Q. Then it would seem that so far as the use of netting, wire netting, in 1877, you considered it a failure?

A. So far as the mesh was concerned.

Redirect examination:

Q. What is the size of the mesh of the screen as you now use it?

A. Three and a half to the inch.

Q. And what was the size of the mesh you used in 1877 and 1878?

A. Quarter inch.

Q. Is that the only difference between screens used in 1877 and the present time?

A. Yes, sir; that is the only difference.

Q. You do not use the door now in the spark-arrestor that you used then?

A. No, sir.

Q. It is the same shape?

502 A. Yes, sir. Before we used to bend them around and lace them with wires, but now we use them in two pieces and join them with angle irons.

Q. It is the same shape and is attached just the same as shown in Defendant's Ex. A?

A. Yes, sir.

Q. So far as the stopping of the sparks is concerned, the only difference between them is the size of the mesh?

A. Yes, sir.

The further taking of testimony adjourned until a day hereafter to be fixed.

503 U. S. Circuit Court, District of New Jersey. In Equity.

FRANCIS KEARNEY and MARY A. TRONSON
vs. } On Bill, &c.
THE LEHIGH VALLEY RAILROAD COMPANY.

Accounting Before a Master of the Court, by its Decree of Oct. 25, 1887, *on File of Record in this Cause.*

To the honorable the judges of the said court:

The undersigned, the master, to whom the foregoing-entitled cause was referred, respectfully submits the following report:

That he met the parties interested in this accounting, with their counsel and witnesses, from time to time, heard and reduced the testimony of their respective witnesses to writing, which is herewith furnished and submitted to the court, and heard the arguments of counsel for the complainant- and defendant in support of their several claims and allegations.

The opinion of the court, filed of record Sept. 30, 1887, holds that the complainants are entitled to a decree for the infringement of the complainants' first claim of the patent in suit and an account of the profits and damages in the usual form, and it is ordered 504 by the court that the patent named in the complainants' bill is a good and valid patent, and that the defendant has infringed the first claim of the said patent; that the master ascertain and state an account of the damages resulting to the complainants from the said infringement, and the gains, profits, and advantages which the defendant has realized from the use of the infringing instrument, and that the complainants recover of the defendant their costs to be taxed.

Under this decree the complainants claim a difference in the cost of construction between the diamond and the straight smoke-stacks used in connection with the infringing spark-arrester.

Also a saving of renewals of diamond stacks.

Also a saving in netting every three months.

And a saving in the time and labor of mechanics, amounting in the aggregate to about ten thousand (10,000) dollars, in addition to the gains, profits, and advantages the defendant has realized from the use of the infringing device.

But the opinion of the court is that "the invention has relation to the form and construction of the spark-arresting grate, and to that only, and as applicable to one kind of pipe as another."

To all of this the counsel for the defendant strenuously objects,

excepting the claim for the difference of the cost of construction between the two screens, and for this he claims that the com-
505 plainants are entitled to nominal profits only.

The master is bound by the opinion of the court, and the court has said the complainants are entitled to the damages, gains, and profits resulting from the use of the spark-arresting grate, and to that only.

It appears from the evidence of John J. Kinsey, Feb'y 7, 1888, the master machinist of the defendant company, that the defendant did realize gains and profits from the construction and in the use of the infringing device during the period of infringement instead of the rim-net stack screen previously used, and it appears from Mr. Kinsey's evidence and "Complainants' Exhibit Kinsey's Statement of Cost, S. D. O., master, February 7, 1888," that under the first claim of the infringed patent the defendants were enabled to make and use cast-iron screens at a saving in cost of two dollars and sixty-two cts. per screen; that the defendants made one hundred and eighty (180) sets of these infringing spark-arresters used on their locomotives at a saving of $2.62 *cts.* per screen, amounting in the aggregate to four hundred and seventy-one (471.60) dollars and sixty cents, and this sum of $471.60 the master finds and reports to the court in favor of the complainants against the defendant, with interest from the date of the filing of this report, and costs to be taxed.

No claim is made for damages by the complainants, nor are any damages found by the master to have been sustained.

All of which is respectfully submitted.

June 8, 1889.

S. D. OLIPHANT, *Master, &c.*

Filed June 8, 1889.

506 United States Circuit Court, District of New Jersey.

FRANCIS KEARNEY and MARY A. TRONSON, Compl'ts,
and
THE LEHIGH VALLEY RAILROAD COMPANY, Def'ts.
} On Bill, &c. Exception to Master's Report.

The complainants hereby except to the report of S. D. Oliphant, Esq., the master *pro hac vice* to whom reference was made to ascertain and state an account of the damages resulting to them from the infringement by the defendant and the gains, profits, and advantages which the defendant had realized from the use of the infringing instrument, which report bears date and was filed the eighth day of June, eighteen hundred and eighty-nine:

First. Because the said master fixed the amount of gains and profits realized by the defendant at two dollars and sixty-two cents per screen as the difference in cost of the "rim-net stack screens previously used" by the defendants and the infringing device, basing said amount on Mr. Kinsey's statement of cost, when, as a matter of fact, said statement was not the cost of the rim-net stack screen, but

of a wire screen placed in the smoke-arch, which the defendants
507 ants could not use except by adding a spark-box costing from ninety to one hundred dollars per locomotive.

Second. Because the said master construed the words " the invention has relation to the form and construction of the spark-arresting grate, and to that only, and as applicable to one kind of pipe as another," contained in the opinion of Mr. Justice Bradley in this cause, as excluding the consideration of the diamond stack in determining the defendants' gains and profits, when, in fact, said language referred to the petticoat or other pipe to which the infringing device was attached and not to the stack at all.

Third. Because the said master refused to allow to the complainants the gains and profits realized by the defendants in using the infringing device as a spark-arrester instead of the diamond-stack cone and netting as the spark-arrester in common use by the defendants until the adoption of the infringing device and by other railroads previous to and during the time of use by the defendants of the infringing device, which profits consisted of difference in cost of construction between the diamond stack and straight smoke-stacks used in connection with the infringing device, a saving of renewals of diamond stacks, a saving in netting every three months, and a saving in the time and labor of mechanics, amounting in three
508 years (the average time the defendants used the infringing device on one hundred and twenty-eight locomotives) to about eighty-three dollars per locomotive, or a total of more than ten thousand six hundred dollars, and which amount said master should have allowed to the complainants.

ELWOOD C. HARRIS,
Solicitor of Compl'ts.

(Exceptions to master's report, filed July 3, 1889.)

509 U. S. Circuit Court, Dist. of N. Jersey.

FRANCIS KEARNEY & MARY F. TRONSON
v.
THE LEHIGH VALLEY RAILROAD COMPANY.

On exceptions to the master's report.

The master allowed the complainants in this case only the difference in first cost between the wire netting previously used in the smoke-arch by the defendants, in 1877, and the cast-iron-bar grating then adopted in violation of the patent. I think that this was an insufficient allowance. It is perfectly evident from the testimony, carefully examined and analyzed, that the reason for adopting the complainants' iron-bar grating was not merely its cost, but because it answered a better purpose. Although the netting cost more than the iron grating, it was thrown aside before it was worn out—nay, after it had been used but a few months—and the iron grating was substituted in its place. Why throw the netting away if it was as good as the iron grating? The pretence

that it was thrown away because it cost more is too thin. It was thrown away because it did not answer the purpose, and the iron grating was adopted because it did answer the purpose.
510 It was adopted not only in the engines that had the netting, but in the other engines of the company which had the diamond chimneys with netting and cone in them.

The difference in cost of the two devices is undoubtedly one item in the profit realized by the company, but not the only profit. They must have realized a profit in the superior excellence of the complainants' iron-bar grating over both the netting used in the smoke-box and that used in the diamond stack. The cost of the latter, with the diamond bulge in the stack, and its frequently needed repairs considerably exceed the cost of the iron-grate netting with a straight stack. It is this difference which the complainants seek to recover without going into the question as to the savings realized from the superior quality of the iron grating as a spark-arrester.

But whether the iron grating was superior to the netting in the diamond stack or not, it evidently answered the purpose of the defendants, for they used it until stopped by the injunction, a period of four or five years, and during all that time saved the additional cost of the diamond stack and its fixtures. I do not well see why the complainants are not entitled to this difference. By the complainants' calculation they make out a profit of $83.60 on each locomotive by the use of the iron grating instead of the grating in the diamond stack. Perhaps this calculation exceeds the truth. That is a question of fact which ought to be settled by the master, and the matter will be referred back for that purpose.
511 The defendants contend, however, that the iron grating with horizontal slots was open to them, and that they adopted its use after the injunction, and that the profit of using the complainants' device over that of using the horizontal grating was inconsiderable. The complainants' counsel very properly replies to this argument that the horizontal grating had never been used alone as a spark-arrester and that the defendants got it up as a succedaneum after they were enjoined from using the complainants'. The latter was used by them for more than four years in preference to everything else and at a great profit over the arresters they had ever used before. If the horizontal bar was so effective and useful and so much cheaper than diamond-stack arresters, why did they not use it before? The argument and the acts of the defendants do not agree.

An order will be made allowing the exceptions to the extent indicated in this opinion and referring the case back to the master with instructions to allow the complainants, by way of profits realized by the defendants, the difference between the cost and expense of the diamond-stack arresters and incident to the use thereof as compared with the cost and expense of the iron-bar-grate arresters used by the defendants in violation of the patent sued on and the incidents to their use.

Opinion on exceptions. (Filed Sept. 27, 1889.)

35—314

512 Circuit Court of the United States, District of New Jersey.

FRANCIS KEARNEY & MARY F. TRONSON
v.
THE LEHIGH VALLEY RAILROAD COMPANY.
} On Bill, &c.

On exceptions to the master's report.

The exceptions to the master's report having been argued by counsel, it is ordered that the said exceptions be sustained, and that the matter be referred back to the master, and that he allow to the complainants in the accounting, by way of profits realized by the defendants in using the invention of the complainants, the difference between the cost and expense of constructing and using the diamond-stack spark-arresters, including the cost and expense incident to such use, and the cost and expense of constructing and using the iron-bar-grate spark-arresters decreed to be an infringement of the patent sued on, for the time and to the extent which they did use the same, including the cost and expense incident to such use, and that the master, for the purpose of ascertaining the truth of the matter, be, & he is hereby, authorized to use the evidence heretofore taken in the cause.

Dated Trenton, September 27th, 1889.

JOSEPH P. BRADLEY,
Circuit Justice.

(Filed Sept. 27, 1889.)

[Endorsed:] No. 27. Circuit court of United States, dist. of New Jersey. Kearney & Tronson *v.* Lehigh Valley R. R. Co. On bill, &c. Orders ustaining exceptions to master's report. Filed September 27, 1889.

513 Circuit Court of the United States, District of New Jersey.

KEARNEY & TRONSON
vs.
LEHIGH VALLEY RAILROAD COMPANY.
} On Bill, Decree, &c. Supplemental Order.

The master to whom the matter was referred back in this case having asked for instructions as to whether he is authorized under the order of reference to take further testimony in the matter of damages and profits, it is now hereby ordered that he have leave to take such further testimony as he may deem proper to enable him to report fully upon the matters referred to him, such being the intent of said order of reference.

Dec. 3d, 1889.

JOSEPH P. BRADLEY,
Circuit Justice.

Filed Dec. 4, 1889.

514 U. S. Circuit Court, District of New Jersey. In Equity.

KEARNEY *et al.*
vs.
THE LEHIGH VALLEY RAILROAD CO. } On Bill, &c. Accounting Before Master.

Master session, at his office, U. S. Government building, Trenton, N. J., Feb'y 18th, 1890.

Present: E. C. Harris, Esq., solicitor for complainants; Andrew McCallum, Esq., solicitor for defendant, and the master.

515 Counsel for defendant offers in evidence affidavit made by George W. Strattan, master mechanic of the Pennsylvania Railroad Company, at Altoona, Penn., together with two blue-print drawings therein referred to.

Counsel for the complainant- objects to the affidavit and blue-print drawings being offered in evidence, except under the agreement of the counsel of defendant to call Mr. Strattan as a witness, with the right of cross-examination if hereafter required.

To which counsel for defendant agrees.

WILSON B. SOLLIDAY, a witness produced on the part of the defendant, being duly sworn, deposes as follows:

Q. Please state what your business is.

A. Business is chief clerk for J. I. Kensey, master mechanic of Lehigh Valley railroad.

Q. I understand Mr. Kinsey is not able to be present at this hearing on account of sickness?

A. Yes, sir.

Q. What instructions, if any, did he give you when he told you to come here?

Question objected to as incompetent.

A. Mr. Kinsey said that he was sick, unable to be present today, and he would have to ask Mr. Turner and myself to represent him in this case. As I made out the costs of the different parts of
516 the different smoke-stacks, I should explain the items.

Q. Did you make out the statements of the costs of the stacks now shown to you?

A. Yes, sir.

Q. What does the first statement show?

A. The first statement shows the number of locomotives furnished with vertical cast-iron screens, and an itemized cost to make one wire-netting screen as used in the straight stacks, and the difference in the cost of the two.

Q. Compare that statement with Complainants' Exhibit Kinsey Statement of Cost and state whether or not they are the same.

A. Yes, sir; I find them to be the same.

The statement referred to is offered in evidence and marked Defendant's Exhibit Kinsey Statement of Cost No. 1.

Q. I show you another statement of cost. What does that refer to?

A. It refers to the cost to make one straight stack for freight engines and a straight stack for a passenger engine and a lifting pipe for straight stack.

The statement referred to is offered in evidence and marked Defendant's Exhibit Statement of Cost Straight Stack.

Q. I show you another statement. What does it refer to?

A. It refers to the cost to make one locomotive diamond stack and to make a spark-arrester for diamond stack and to make
517 a lifting pipe for a diamond stack.

The statement referred to is offered in evidence and marked Defendant's Exhibit Statement of Cost Diamond Stack.

Two drawings are also offered in evidence—one marked Defendant's Exhibit Straight Stack, and the other Defendant's Exhibit Diamond Stack.

Q. How did you obtain the items which go to make up these statements?

A. The men in the shop were ordered to make one locomotive diamond stack. The time was kept and material used was charged, and from these accounts the cost of the diamond stack was obtained, and in the same way the cost of the spark-arrester in diamond stack was obtained, and in the same way the lifting pipe for diamond stack was obtained.

Q. Referring to Exhibit Statement of Cost of Diamond Stack, I find the total cost of the stack and netting to be $26.71. Is that correct?

A. No, sir; the cost of the stack is $26.71 and the spark-arrester is $4.40; that would make $31.10.

Q. Are you not mistaken? I notice that the statement says: Deduct from above that which appertains to the spark-arrester in diamond stack, $4.40?

A. Yes, sir; I see the items for spark-arrester are included in the cost of $26.71, and should not be added to it. It is plain now that the cost of the diamond stack is only $26.71.

518 Q. Of which amount $4.40 is the cost of the spark-arrester?

A. Yes, sir.

Q. And $22.31 the cost of the stack proper?

A. Yes, sir.

Q. Then that does not include the cost of the lift-pipe in the smoke-box?

A. No, sir; the items entering into the cost of lifting pipe for a diamond stack are not included in the cost of above $26.71.

Q. The lifting-pipe items amount to $5.53, I believe?

A. Yes, sir.

Q. Referring now to Exhibit Statement of Cost of Straight Stack, I find the total cost of the stack for freight engines stated as $18.53, and that the stack for passenger engines will cost $3.23 more. That does not include the cost of the cast-iron screen in the smoke-box, does it? I refer to the screen like the model now shown you.

A. No, sir; it does not.

Q. Nor does it include the cost of the lifting pipe, does it?

A. No, sir.

Q. I understand the cost of the vertical cast-iron screen is $2.87. Is that correct?

A. Yes, sir.

Q. And the cost of the lifting pipe for straight stack is $2.74?

A. Yes, sir; that is correct.

Q. Then, to get at the total cost of the straight stack and spark-arrester with its lift-pipe, you would have to add the cost of
519 the two latter items to the figures first referred to?

A. Yes, sir.

Q. What would that make the total cost for the freight engine?

A. That would make the cost $24.14.

Q. And for the passenger engine?

A. And for the passenger engine $27.37.

Q. Look at the drawings, Exhibits Diamond Stack and Straight Stack, and state what they represent.

A. This drawing represents a straight stack.

Q. Does it show the same construction used by the Lehigh Valley Railroad Co.?

A. So far as I can see, it does.

Q. Compare it with the model I show you and state if they are the same with the exception of the form of the screen.

A. The stack seems to be the same with the exception of the difference in the spark-arrester.

Q. Does the model without the arrester or detached therefrom truly represent the straight stacks used by the Lehigh Valley railroad on Lehigh and N. J. division?

A. Well, I would think that it did.

Q. Do you know of any other construction of straight stacks used by the road?

A. I do not know of any other.

Q. The model of the spark-arrester which accompanies the model of the stack represents the vertical cast-iron screen referred to in Defendant's Exhibit Kinsey Statement of Cost No. 1. Is that correct?

520 A. Yes, sir. I wish to make myself better understood. I have said that this stack represents exactly what we use. We use a stack like the drawing. The difference between the drawing and the model: The model seems to be of one thickness of metal and the drawing represents a casing.

Q. There is an outer casing on all the straight stacks in use on the road as shown by the drawing. Is that correct?

A. Yes, sir; that is correct.

Q. And the model shows the appearance of the stack used?

A. Yes, sir; with the exception of the casing not being represented, in my judgment.

The model is offered in evidence and marked Defendant's Exhibit Straight-stack Model.

Defendants also offer in evidence a model of the diamond stack shown by Defendant's Exhibit Diamond Stack, and the same is marked Defendant's Exhibit Diamond-stack Model.

Q. Do all the straight stacks in use on the Lehigh Valley railroad have the same parts as are referred to in the Exhibit Statement of Cost Straight Stack?

A. So far as I know, they do.

Q. And they all have the lifting pipe and a spark-arrester of some kind, I presume?

A. Yes, sir.

Q. Can you also say that the diamond stack used by the Lehigh Valley railroad embodied all the items or parts set forth in Defendant's Exhibit Statement of Cost of Diamond Stack?

A. Yes, sir.

521 Q. You have referred to the casing shown by the drawing of the straight stack. What is the separate cost of said outer casing as itemized in the statement?

A. The casing of a straight stack cost $2.46.

Q. And what is the separate cost of the casting at the top of the stack?

A. The top casting, finished, cost $4.53.

Q. The bottom casting, as I understand, is common to both the straight and diamond stack?

A. I believe it is.

Q. Then, if I understand aright, the addition of the casing and top casting of the straight stack amounts to a cost of $6.99. Is that correct?

A. Yes, sir; that is correct.

Cross-examination by Mr. HARRIS:

Q. Are either of these items of casing or of casting at the top matters of any use in these straight stacks?

A. I do not know.

Q. Will a straight stack answer its purpose as well without as with these?

A. I don't know.

Q. Did you ever run a locomotive?

A. No, sir.

Q. Are you a mechanic?

A. I am the chief clerk.

Q. You hav-n't answered my question. Did you ever work

522 as a mechanic in the construction of locomotives?

A. No, sir.

Q. Do you know what the smoke-stack of a locomotive is for?

A. I presume that it is used for a smoke-stack.

Q. Will you look at this model, a straight stack, and tell me whether in your judgment, as a means for carrying smoke, gases,

&c., from the locomotive, an outside casing or an outside cast rim at the top will make any difference?

Question objected to as not cross-examination and calling for the opinion of an expert.

A. I do not know.

Q. In whose writing are these three statements that have been offered in evidence?

A. Statement No. 1 and statement of cost of diamond stack are in my writing. The last part of statement cost of straight stack is in my handwriting and the first two sections in the writing of my assistant.

Q. Who gave you the data for making up these statements?

A. Mr. Kinsey furnished me with some few figures; the timekeeper with the balance, except what I gathered myself.

Q. When was the work done that is represented by these statements?

A. Well, I will say the first one was made in '87 or '88; the one of straight stack, the work on the straight stack was done Nov., 1889. The work on the diamond stack was done, I would think, in Nov., 1889.

Q. How does the last come to be dated, then, Oct. 27, 1889?

523 A. The date, I suppose, is copied from our former experiments.

Q. In your statement that these figures represent the cost of these different items you have depended largely upon the statements of others made to you, have you not?

A. No, sir; not largely.

Q. In what particulars, then?

A. Well, I can't remember just exactly the particular items there.

Q. Is it labor or material?

A. It is probably one or two items of each.

Q. What items particularly?

A. I couldn't designate them.

Q. Were you in the employ of the Lehigh Valley Railroad Company from Jan. 1st, 1879, until March, 1883?

A. I was.

Q. Have any of these figures which you have given us in these statements been taken from the actual construction of stacks or spark-arresters at that time?

A. From '83 to '87?

Q. No; from '79 to '83.

A. My memory can't go back that far.

Q. Is it not a fact that all these statements have been made from material and labor as done during the past year or year and a half?

A. Only in such cases where we had found that we were wrong in price.

524 Q. In what particular on these sta-ments did you find you were wrong in price?

A. In the item of wire netting. I think at one time I had it 33c. per square foot.

Q. Why did you change it to 27c.?

A. Because it was 6c. too high.

Q. 27c. represents the price of wire netting at what time?

A. The latter period of 1889.

Q. What was the price of wire netting from 1879 to 1883?

A Cannot remember.

Q. Was it not much higher than in 1889?

A. It was, I presume, higher.

Q. About how much higher?

A. I could not say.

Q. The price of No. 10 iron, of which the stacks were made, in each of these statements is given as three and one-half cents a pound. What was the price of that same iron in 1879 to 1883?

A. I could not say, but think of that quality, No. 10, was very little higher. Flange No. 10 was great deal higher.

Q. Do you not think it was 15 % higher than in 1889?

A. I should hardly think so.

Q. Are you familiar with the price paid for labor in those two periods I have mentioned?

A. Yes, sir.

Q. How do the wages of mechanic- in your shops compare in the period from 1879 to 1883 and the year 1889?

A. Very little difference, if any.

525 Q. Have you in the meantime introduced machinery for doing much of the work that in the former period was done by hand?

A. Not in that department.

Q. In the diamond stacks used by your company prior to 1879 was the netting placed in the same position as in the model diamond stack or was it a larger circular netting attached to the diamond stack at its largest diameter?

A. I don't remember that we had any that differed greatly from this.

Q. In Exhibit Statement of Cost of Straight Stack there appears the following: Straight stack for passenger engine will cost $3.23 more. Does that extra cost relate exclusively to sheet brass for bands and to iron for casing and the work thereon.

A. It relates *for* sheet brass and labor for bands and jacket iron and labor for casing.

Q. Are those brass bands shown on this model straight stack by these two bands made the color of brass?

A. I presume so.

Q. Do you know of any use of these brass bands except ornamentation?

A. I don't know anything about it, except the cost.

Q. I think you said in your direct examination that the bottom casting would be the same in either a diamond stack or a straight stack?

A. I think I did.

Q. Do you know why in these statements 88c. is charged

526 on the diamond-stack statement and $1.22 on the straight-stack statement?

A. The difference is in the weight.

Q. Can you see any reason why the same casting shouldn't be used in both stacks?

A. That is outside of office work.

Q. repeated.

A. I don't know where the difference would be.

Q. repeated.

Question is objected to — same reason as before stated in former objections. It is not cross-examination and calls for the opinion of the witness on a matter which he is not shown to be competent to answer.

A. No; I can't.

Redirect:

Q. The cost of iron and other materials set forth in the two statements, cost of straight and diamond stack, is charged the same?

A. Yes, sir; I believe it is.

Q. Is there any more charge in the rate of labor in the one than in the other?

A. No, sir; not when the same men of the same rate work. We might have a man working at 20c. on one and 17½c. on the other.

Q. Well, as a matter of comparison of cost, the materials and labor are charged at the same rate?

A. Yes, sir.

527 Q. As to difference between the cost of the two stacks, would there be any material difference whether the comparison had been made in the year 1883 instead of the year '89?

A. I don't think that they would.

Recross:

Q. In the one item of No. 10 iron there are 273 pounds in the diamond stack and 144 and one-half pounds in the straight stack. Do you say that the price of iron in this one item would not make a large difference?

A. The price of iron in both No. 10 are alike. The difference in the number of pounds would be great if there was much difference in the price of the iron.

Adjourned until 1.30 p. m.

528 Amos Turner, a witness for defendant, being duly sworn, deposes as follows:

Direct examination by Mr. McCallum:

Q. Please state your business and residence.

A. Am foreman of the Lehigh Valley machine shops, and also have charge of the locomotives.

Q. How long have you been in the employment of the Lehigh Valley railroad?

A. 25 years.

Q. Are you familiar with the smoke-stacks and spark-arresters used on the road during that time?

A. I am.

Q. Please look at the drawing of Defendant's Exhibit Diamond Stack and model Exhibit Diamond Stack and state if said drawing and model truly represent the diamond stack used on said road.

A. Yes, sir; they do.

Q. Do you know anything about the cost of such diamond stack?

A. No, sir.

Q. Do you know anything about their use?

A. Yes, sir.

Q. Can you say how long the wire netting at the top of the stack will last without requiring renewal?

A. That will depend on what use the engine is put to.

Q. For example?

A. An engine running on a passenger train at a higher
529 rate of speed would require renewal oftener than one run-
ning at a slower rate.

Q. From your experience, what is the average life of these wire nettings?

A. About one year.

Q. That is taking all classes of work that the locomotive has to do?

A. Yes, sir.

Q. What is the average life of the diamond stack itself; does it ever wear out?

A. Yes, sir; it wears out.

Q. How long will it last before it requires a renewal, on an average?

A. I can't tell.

Q. Can you say it would last longer than a year without requiring renewal?

A. Yes, sir.

Q. How much longer, would you say?

A. Well, I would say it would last two years.

Q. Is that your experience?

A. That has been my experience.

Q. How about the deflector or cone?

A. Well, they run from a year to fifteen months.

Q. Are they all made with the lower casting or saddle?

A. Yes, sir.

Q. Please look at the drawing Defendant's Exhibit Straight
530 Stack and state if that shows the construction of the straight
stacks used by the Lehigh Valley railroad.

A. This drawing shows the construction as are now used by the road.

Q. Does the model Exhibit Straight-stack Model represent the stack as that appears?

A. No, sir.

Q. How is it as to the external appearance?

A. It is right.

Q. The difference, I understand, is that it does not show the outer casing as shown in the drawing. Is that correct?

A. Yes, sir.

Q. Can you say how long these straight stacks will last without repair?

A. Not exactly.

Q. What to the best of your knowledge?

A. To the best of my knowledge, cut them out in two years.

Q. What description of spark-arrester is used with this straight stack by the Lehigh Valley railroad?

A. At present we use wire netting the same as shown in the drawing.

Q. Do you remember the use of cast-iron screen nettings?

A. Yes, sir.

Q. Like the model attached to the straight-stack model?

A. Yes, sir; with the exception of the shape. The one we actually used was round; this is oval.

Q. How long would these metal screens last without renewal, do you remember?

531 A. I do not remember.

Q. Please state how these cast-iron screens were used and what was the result of their use.

A. They were used in the smoke-head of a locomotive, the top being fastened to a pipe extending from the smoke-stack down, commonly called the lifting pipe. The bottom was fastened to a flange that was cast to the exhaust pipe for the arresting of sparks.

Q. Did they arrest the sparks and keep them in the box?

A. The majority of the sparks were kept in the box.

Q. What did you do to get rid of them?

A. We had each engine supplied with a shovel and scraper and had the men to clean them out.

Q. How often did you have to clean them out?

A. Twice a day always and very often much oftener.

Q. Did you have to clean them out during the run of an engine?

A. Yes, sir.

Q. How frequently did that occur?

A. Well, I would say on heavy trains every twenty or twenty-five miles.

Q. How long did it take you to clean out the smoke-box?

A. Where they didn't have to clean more than two or three times a day it would probably be done in one hour.

Q. Do you mean one hour for each time?

A. No, sir.

Q. Then you mean one hour for every two or three times?

A. Yes, sir.

532 Q. To the best of your knowledge what would be the average time each day required to keep the smoke-box of the locomotive clean when these cast-iron spark-arresters were used?

Q. Do you not know that that is the case?

A. Not positively.

536 Q. Is it not true that the one deflects all the cinders or sparks, throwing them against the side of the diamond part of the stack?

A. I do not know.

Q. Is it not true that large cinders are carried up into the diamond stack as well as the small ones?

A. That I do not know.

Q. Is there a lodgment of cinders in the smoke-box, when you were using the diamond stack, that you had to shovel out from time to time?

A. Well, that is a long time ago to go back.

Q. It's just before you used the cast grating, isn't it?

A. I am not positive.

Q. Before coming here did you and Mr. Kinsey have a talk about this matter?

A. No more than Mr. Kinsey said he was not able to come down and he wanted Mr. Saliday and myself to represent him.

Q. Have you any recollection as to which form of arrester most frequently needed repairs, the diamond stack or the cast grating?

A. No, sir; I have no positive recollection.

Q. What recollection have you?

A. My recollection is that there would be very little difference.

Q. Is your recollection on that point as good as it is with reference to the length of time that these two stacks, the diamond and
537 the straight stack, would run without having to be renewed?

A. Well, I would say there would be no difference.

Q. Do you mean that your recollection is as good in one case as in the other?

A. To the best of my knowledge.

Q. Is there anything that fixes in your mind the length of time that these respectively would run before having to be renewed?

A. Only from ordinary observation; that is all.

Q. Do you know the construction of the diamond stack as used on the locomotives of the Delaware, Lackawanna and Western railroad?

A. No, sir.

Q. Have you ever seen those locomotives with that sort of a smoke-stack?

A. I have seen the locomotives, but never paid no particular attention to the stacks.

Q. Have you ever seen the diamond stack used on the Pennsylvania railroad?

A. I have seen diamond stacks on Pennsylvania engines.

Q. Do you know how the netting was placed in those diamond stacks?

A. No, sir.

Q. Is this model of diamond stack offered in evidence today the same form used by the Lehigh Valley Railroad Company previous to the time they used the cast grating?

538 A. Yes, sir.

Q. Was there not a section in the stack then used extending vertical above the top of the flaring parts some four or five inches?

A. To the best of my knowledge, we never made any other stack than the one represented there with netting on the top.

Q. Was John Clark in the employ of the company at the time you used the diamond stack?

A. Yes, sir.

Q. Did you never construct this stack with the netting of the diameter of the largest part of the diamond stack and held in place by being bolted or riveted between the lower and upper sections of the diamond stack?

A. Not to my knowledge; we never made a stack of that kind.

Q. How is the netting fastened in the form of the model?

A. There is an inner ring with a flange, and the netting rests on that, and there is a ring placed around on the top of the netting, leaving the netting between the rings.

Q. How are those flanges fastened together to hold the netting?

A. It is fastened right in the top of the smoke-stack.

Q. How is the ring on one side of the netting fastened to the flange on the under side?

A. This top of the smoke-stack is a cast-iron ring with a flange cast on it; wire is laid on this, and the other ring comes on the top and the two rings are bolted together.

Q. How are those bolts set, with the heads up or down?

539 A. To the best of my knowledge, those were tap-bolts, with the heads up.

Q. You mean the thread was cut in the flange?

A. Yes, sir.

Q. In order to put in a new netting what was necessary?

A. To take the ring out and lift the netting out.

Q. Are you familiar with the cost of iron?

A. No, sir.

Q. Do you know how the cost in 1889 compared with the cost in 1880?

A. No, sir.

Q. Does the brass ring or the cast ring, as shown on the model straight stack, have anything to do with the usefullness of the stack?

A. I don't know.

Q. Would the stack steam as well without as with these outside parts?

A. That I don't know, for I have never tried it.

Q. Can you conceive of any use of these parts I have just mentioned or an outside casing except ornamentation?

Objected to.

A. I don't know.

Q. Does any other use occur to you?

A. That top casing helps to make the stack stiffer on the top.

Q. In what way?

A. By having that casting riveted to that stack it makes the top stronger and stiffer.

540 Q. Between the point of the bottom of this casting and the top of the casting that rests on the boiler is there any casting to stiffen the smoke-stack?

A. No, sir.

Q. If this heavy piece of casting is needed at the top, why is it not needed all the way down?

A. Well, I wouldn't consider it necessary.

Q. Is there any more strain on the stack just near the top than there is half way down?

A. Not in use.

Q. What is the purpose of the casting at the bottom of the stack where it rests on the boiler or smoke-arch?

A. To attach the smoke-stack to the smoke-arch.

Q. Do you see any reason why a heavier casting or different casting is needed in attaching the straight stack from that used in attaching the diamond stack?

A. Yes, sir; the way we construct our stacks. It is heavier on the straight stack. In order to make a neck for the outer casing we put on the straight stacks.

Q. Is that outer casing needed to strengthen the straight stack?

A. I don't know; we have always built them that way.

Q. Do you think the casing is for the purpose of preventing the appearance of the stack being marred by the paint burning off from the heat?

A. Probably that was what it was put on for.

Q. To avoid the burning off of the paint in the diamond stack you would have to case it the same way, would you not?

541 A. I suppose you would.

Q. Do you remember that when the company used the diamond stack without a casing you frequently had to paint stacks?

A. I have got no recollection.

Q. At the present time how often do you have to put new stacks on your locomotive?

A. Well, to the best of my knowledge, they would probably average two years.

Q. In that time is the inner portion of the stack worn through by the cinders?

A. That is the only time they are taken off.

Q. With a netting used at the present time that stops all but the very fine cinders, how do you account for a straight stack being cut out as quickly as a diamond stack when all the coals were carried up with the force of the exhaust and deflected against its sides?

A. I don't know.

Q. Don't you think your memory is very defective as to the time the diamond stacks would wear twelve or thirteen years ago?

A. My memory generally is good.

Q. In your duties as performed from 1876 to 1883 had you knowledge of the frequency of repairs of the spark-arrestors?

A. That came under another department, generally.

Q. During the same time in your department had you knowledge of the repairs or the renewals of the diamond stack?

A. I was generally around when it was being done.

542 Q. Did you have direction in the one case more than in the other?

A. In what case?

Q. In the new diamond stack or the repair of the netting in it.

A. Not any more in one than in the other.

Q. How do the wages of the men compare now with the wages ten years ago?

A. Very little difference, if any.

Q. Have you ever seen a diamond stack with the netting the size of the largest diameter of the stack?

A. Never seen any put in that way.

Redirect:

Q. I think you stated in your cross-examination that the straight stacks used by the Lehigh Valley Railroad Company have always been made like the drawing with the outer casing and top and bottom castings. Is that correct?

A. Yes, sir.

Q. Where did you get the pattern from which to make them?

A. The original patterns came from Alexander Mitchell, Wilkes Barre.

Q. Is that same pattern of the straight stack adopted by other roads, as far as you know?

A. As far as I know, the Pennsylvania are using stacks very similar to this.

Q. You were asked respecting the cause of wear or cutting out of the stack. Might not the friction of the steam passing through the stack affect its wear?

543 A. Yes, sir.

Q. As a matter of fact, do you know whether it does or not?

A. Well, in my judgment it would.

Q. Does it affect the wear of the nozzles through which the exhaust steam passes?

A. I think not.

Q. Can you explain why it should effect the stack and not the nozzle?

A. I can't give an explanation.

WILSON B. SOLLIDAY recalled.

Direct examination by Mr. McCALLUM:

Q. Can you state about what is the cost of the spark-box attachment which is now used on the locomotives of the Lehigh Valley Railroad Co.?

Objected to as irrelevant.

A. I would think, from memory, about $77.

By agreement of counsel the signature of witnesses is waived. Adjourned until further notice from either side.

[Endorsed:] No. 29. New evidence for def'd't.

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544 United States Circuit Court, District of New Jersey.

KEARNEY & TRONSON
vs.
LEHIGH VALLEY R. R. Co.
} Equity.

Personally appeared G. W. Strattan, who, being duly sworn, deposes and says as follows:

I am master mechanic of the Pennsylvania Railroad Co. at Altoona, Pa.; I have been in that position since 1870; I have been in the employ of the company since 1861, from which time I have been familiar with the locomotive smoke-stacks and spark-arresters in use on said road. In 1861 and for some years thereafter we used what was known as the Laird stack, which was something like a wood-burning stack. Subsequently we experimented with what is now known as the diamond stack, different forms of which were used; we also, about the year 1869, commenced to use straight stacks with what is known as the Smith spark-arrester located in the smoke-box. On the 24th day of June, 1874, the approved diamond stack was made standard for freight engines, and the Smith spark-
545 arrester and straight stack was made standard for passenger engines. The straight stack and Smith spark-arrester remained standard until the adoption of what is known as the extended smoke-box spark-arrester, which is now standard. We still have a large number of freight locomotives equipped with the diamond stack. On referring to my books and private memoranda I find that the cost of a diamond stack, exclusive of saddle which connects with the smoke-box, is as follows:

No. 2.

Sheet-iron work	$18 17
Netting	3 60
Cone	1 14
Rods, bolts, and labor	1 37
Bottom ring	1 32
Lift-pipe	3 16
Lift-pipe braces	1 34
Labor putting them in	50
Total	$30 60

The cost of a straight stack with Smith spark-arrester, exclusive of saddle, is as follows:

Sheet-iron work	$10 57
Cast-iron top	4 61
Bottom ring	1 82
Lift-pipe	8 00
Arrester	6 95
Total	$31 95

546 The cost of a straight stack, with extended smoke-box arrester, exclusive of saddle, is as follows:

Sheet-iron work	$10 57
Cast-iron top	4 61
Bottom ring	1 82
Netting, bolts, and manhole plate used in smoke-box	9 69
Labor	4 00
Total	$30 69

I find that a diamond stack will last, on an average, about 13 months before needing repairs. I find from a memorandum made by me in the year 1875 that the life of a cone in a diamond stack ranges from 8 months to 30 months; but 9 cases recorded ranged from 8 months to 16 months; the longer periods were exceptional.

The average life of the wire netting in a diamond stack, before it requires renewal, is about a year; some will run longer, some shorter, depending somewhat upon the exhaust used.

The lift-pipe of the diamond stack above referred to is what is sometimes known as the petticoat pipe, which projects down into the smoke-box.

The lift-pipe of the Smith spark-arrester is also located in the smoke-box. There is no lift-pipe in the extended smoke-box spark-arrester, but the steam nozzles extend up above the netting.

547 The construction of the diamond stack and the straight stack with Smith spark-arrester, herein referred to, are shown on the blue prints herewith.

G. W. STRATTAN.

STATE OF PENNA.,
County of Blair, } *ss:*

Personally appeared before me, a notary in and for said county, G. W. Strattan, who, being duly sworn according to law, says the above is true and correct.

Witness my hand and notarial seal this the 15th day of January, A. D. 1890.

W. D. COUCH, [SEAL.]
Notary Public.

548 United States Circuit Court, District of New Jersey.

Kearney and Tronson
vs.
The Lehigh Valley Railroad Co.

Trenton, N. J., *June 25th*, 1890.

Master's session held at the court-house on the above day.

Present: Hon. S. D. Oliphant, master; Elwood C. Harris, for the complainants; Andrew McCallum, — the defendants.

Mr. McCallum, counsel for the defendants, produced the affidavit of George W. Stratton, master mechanic of the Pennsylvania railroad at Altoona, made Feb. 18th, 1890; also a blue-print drawing offered by defendant, referred to in Stratton's affidavit, which Mr. Harris, counsel for the complainants, consents to accept in
549 lieu of calling the witness Stratton to the stand.

Mr. Harris, counsel for the complainant-, offers in evidence the affidavit of J. W. Sandford, which is to be accepted instead of calling Mr. Sandford on the stand as a witness. He also offers the affidavit of James A. Coe, which is accepted in the same way.

John I. Kinsey recalled on the part of the defendant.

Direct examination by Mr. McCallum:

Q. I understand you were absent from the last session on account of sickness. During said session the statement marked Kinsey's statement of cost No. 1, statement of cost straight stack, and statement of cost of diamond stack were offered in evidence. Please look at the said exhibits and state if they are in accordance with the facts as ascertained by you in making the tests on which they are based.

A. Yes, sir; they are.

Q. At said session there was also offered in evidence two models, Defendant's Exhibit Diamond-stack Model and Straight-stack Model, and in the testimony respecting the same it appears that said models were not strictly in accordance with the stack used on the Lehigh Valley Railroad Company. Have you with you models correctly showing the construction of said stacks in all particulars? If so, please produce them.

550 A. I have.

The witness produced two models, one showing the straight stack and one the diamond stack, as constructed and used by the Lehigh Valley Railroad Company, and the same are offered in evidence as substitutes for the models offered in evidence at the last session.

Q. Do the models you have just produced correctly show the construction of the diamond and straight stacks as used by the Lehigh Valley Railroad Company?

A. Yes, sir.

Q. Has the Lehigh Valley Railroad Company ever made or used straight stacks of any other form or construction than that shown by the model you have just produced?

A. Not on the Lehigh New Jersey division.

Q. During the period of infringement when the cast-iron gratings with the vertical slots were used, what was the construction of the straight stack used in connection therewith?

A. The same as the model I produced.

Q. Are you still making and using stacks of that construction?

A. Yes, sir.

Q. During the said period of infringement and prior thereto what construction of diamond stacks was used by the Lehigh Valley Railroad Company?

A. Those that were made by the Lehigh Valley Railroad
551 Company were the same as the model exhibited, but they
were others different kind of stacks on locomotives purchased
from the makers. Locomotives that we purchased from other companies had different kind of stacks on—not all the same kind.

Q. During your original examination in behalf of complainants, in this accounting, you referred to a book on the first page of which was a drawing showing the different styles of stacks, one to four. Please look at the tracings now shown you and state if that is copied from said book.

A. Yes, sir; this is a copy from the book.

Q. I notice there is a difference in the location of the cone and netting shown by figure No. 3 on said drawing and that shown by the model now produced by you, the latter showing the netting near the top of the stack, while by the drawing it is shown at the widest part. Will you please state what is the actual fact as to the location of this netting in the diamond stack used by the Lehigh Valley Railroad Company—made or used or purchased by them?

A. The drawing was made for the purpose of instructing the men who examined the screens and spark-arrester, so that they could designate the kind of stack or screen that was on each particular locomotive that they examined. The different kind of screens — were used there as shown on the drawing were put on the
locomotives by the builders when we purchased the engine.
552 When we manufactured the stacks or renewed them we
placed the netting in the top of the stack instead of in the
widest part.

Q. Then, if I understand you right, as a matter of fact you never repaired the stack or made a new one that didn't have the netting located as shown by the model submitted. Is that correct?

A. It might have been that way when we renewed those screens in some of those old stacks, but when we built new ones we built them with the screen in the top.

Q. Can you say what proportion of these stacks were built by the road and what proportion purchased with the netting at the widest part of the stack?

A. I can't say.

Q. Can you say what, if any, difference there would be in the cost of the netting, whether the same is put in the top of the stack, as you built them, or put at the widest part, as shown by Fig. 3 in the drawing?

A. As near as I can tell, there would be in the neighborhood of six more square feet in the widest part than there is in the top; as near as I can recall the size.

Q. I notice on referring to statement Defendant's Exhibit Statement of Cost Straight Stack that the stack for the passenger engine costs $3.23 more than the one for the freight engine. Of the 128
engines which were equipped with the infringing device, how
553 many were passenger engines and how many freight engines,
as near as you can tell?

A. I can't give the exact figures, but as near as my memory serves me I should say there was not to exceed one-third passengers and two-thirds freight, but I can give the exact figures from the book.

Q. Have you ascertained from the books the cost of No. 10 sheet iron used in the construction of these smoke-stacks during the period of infringement and the cost of the same iron at the time you made the test on which the statements of cost are based?

A. Yes, sir.

Q. Will you please state what it is?

Objected to by Mr. Harris, who claimed the right of examining the books.

Witness produced a statement entitled "Copy from bill book of common No. 10 iron purchased during the period from 1879 to 1884, both years inclusive; also during the year 1889." The same was offered in evidence on the part of the defendant, and Mr. McCallum stated should the master require the original books they will be produced.

Q. This statement you have produced was taken from the original books of entry, was it?

A. Yes, sir.

554 Q. By whom?

A. By my clerk.

Q. Can you produce the original book if required?

A. Yes, sir.

Cross examination by Mr. HARRIS:

Q. The straight stack you have produced this morning has a casing on it?

A. Yes, sir.

Q. And your construction of the straight stack was with a casing?

A. Yes, sir.

Q. Why was the casing put on?

A. For ornamentation about as much as anything, and to prevent it burning red.

Q. Then the stack without the casing would steam as well as a stack with a casing?

A. It protected it from the atmosphere. It would not be so apt to form condensation with the casing on as without.

Q. The casing was used as a matter of ornamentation, and also that the outside of the stack might not appear red from being heated?

A. Yes, sir.

Q. The heavy casting at the top of the stack is for what purpose?

A. Well, I suppose you might call that ornamentation.

555 Q. Did you put any heavy casting at the top of the diamond stack?

A. Nothing more than to hold the netting in.

Q. Then all the castings that are spoken of in the schedule entitled cost of diamond stack were necessary for fastening the netting, were they not?

A. And fastening to the boiler.

Q. I mean the 45 pounds top casting and 25-pound top ring. Those were necessary for securing the netting?

A. Yes, sir.

Q. And were not there for ornamentation?

A. No, sir.

Q. Was there any casing on the diamond stack?

A. No, sir.

Q. Then, is using the diamond stack in order to keep up the appearance, did you have to frequently paint the stacks?

A. We painted it occasionally.

Q. And the casing used on straight stacks was so that the burning off of the paint would not show?

A. That was it; yes, sir.

Q. The items upon the statement cost of straight stack, eight pounds No. 20 common stove-pipe iron, two hours tinsmith, 47 pounds and 16 pounds iron casing, and the two items of work thereon, refer entirely to the putting on of the casing on the straight stack, do they not?

556 A. I think they do.

Q. Then if the straight stack were made without a casing, as you made the diamond stack, that expense would be unnecessary?

A. It could be made without it, but, as I said, we put that on there when we first made them, and make them that way still. We have never changed the style of it.

Q. I notice in the second schedule, diamond stack and straight stack, the weight of the bottom casting in the diamond stack is 44 pounds, and 61 pounds bottom casting in the straight stack. Do you know why heavier casting was used on the straight stack than on the diamond stack?

A. I can't tell from memory now, but we had two patterns, and I presume that one is made heavier than the other for some purpose or other.

Q. Wasn't it on account of the shoulder to receive the casting?

A. There is a shoulder there. That may be a case.

Q. In the schedule cost of straight stack you have two items of three and a half hours on outside of casting, on each 79c. What proportion of that total of seven hours was put on the 187 pounds on top casting and what proportion on the 61 pounds of bottom casting?

A. I can't answer that question. I see that both the top casting and the bottom casting on the straight stack are turned off to receive the casing, so that I suppose the work is divided about equally on each.

557 Q. Then the work that is stated in this cost of straight stack on these two castings seems to have been made necessary by the fact that the straight stack is made with a casing?

A. Yes, sir.

Q. These items in this same schedule, cost of straight stack for passenger engine, are made up of the bands, being sheet brass instead of common stove-pipe iron, and the casing being jacket iron at 10c. per pound instead of No. 10 iron at 3.7, and the work thereon?

A. Yes, sir.

Q. Does that more extensive material of bands and casings add anything to the efficiency of the stack?

A. The looks more than the efficiency.

Q. Does it add anything to the efficiency?

A. No; I don't know that it does.

Redirect:

Q. Referring to the straight stack as used and without regard to whether the outer casing and castings referred to add anything to the usefulness of the stack, have you in fact ever *and* made and used them without the casing and castings?

A. No, sir.

Recross:

Q. Why didn't you make the casings and put rings and castings on the diamond stack when you used that?

558 A. We could not put them on there, and the diamond stack has a more respectible look than a straight stack would have. When you turn this one up it makes an ornament of it.

Q. Is it not true today that on passenger engines of both the Pennsylvania and the Central railroad perfectly straight stacks are made without any top castings or rings for ornamentation?

Objected to as immaterial.

A. I think they make a portion of them with that on.

Q. And a portion without?

A. Yes, sir.

Q. That is all.

(Signature waived.)

559 United States Circuit Court, District of New Jersey.

KEARNEY & TRONSON
vs.
LEHIGH VALLEY RAILROAD COMPANY.

STATE OF NEW JERSEY, } *ss:*
County of Hudson,

James W. Sandford, of full age, being duly sworn, on his oath saith: I am master mechanic at the Pennsylvania railroad shops, at the Meadows, near Jersey City, and have occupied that position at that place for about two years past. I am familiar with the construction of the straight stack formerly used on the Pennsylvania railroad with the Smith spark-arrester, mentioned in the affidavit of G. W. Stratton, master mechanic, of Altoona, Pa. The average wear of such a straight stack is not less than four or five years; I refer to a stack made of No. 10 iron. A diamond stack made of the same iron cuts out rapidly from the cinders deflected from the cone, and the average wear thereof is about one year. The wire netting of a diamond stack would not wear as long as the stack; it would cut out more rapidly than the stack.

The present cost of the material used in the construction of a stack is less than it was eight or ten years ago and will average about one-fifth less.

J. W. SANFORD.

Subscribed and sworn to before me May 28, 1890.

[SEAL.] WM. H. EMERSON, JR.,
Notary Public of N. J.

560 STATE OF NEW JERSEY, } *ss:*
County of Essex,

James A. Coe, of full age, being duly sworn according to law, on his oath saith that he resides in the city of Newark, New Jersey, and is a wholesale iron merchant and has conducted a large business in buying and selling iron and steel in said city continuously since the year eighteen hundred and sixty-nine; that during the said period deponent has bought and sold constantly No. 10 sheet iron of the quality used in the construction of locomotive smoke-stacks; that deponent has made an examination of his books for the prices of said iron in the years 1879, 1880, 1881, and 1882, and also during a year last past; that the price of said No. 10 sheet iron during a year last past is more than twenty-five per cent. less than the average price of the same iron during the years 1879, 1880, 1881, and 1882.

JAMES A. COE.

Subscribed and sworn to before me June 9th, 1890, at Newark, New Jersey.

[SEAL.] WM. H. EMERSON, JR.,
Notary Public of N. J.

561 U. S. Circuit Court, District of New Jersey. In Equity.

KEARNEY & TRONSON
vs.
THE LEHIGH VALLEY
RAILROAD CO.

} On Bill, &c. Master's 2nd Report on Exceptions to His 1st Report. Filed June 8, '89.

On the 8th June, 1889, the master to whom was referred the matter of accounting & report to the court on its decree of Oct. 25th, 1887, in this cause, filed a report in which he found in favor of the complainant the sum of $471.60, profits. gains, &c., as having accrued to the defendant company by reason of its infringement of the complainants' letters patent, on which this suit is founded.

To this report of the master the complainants filed exceptions on the 3rd of July, 1889, which, on being presented & argued to the court, were sustained to the extent of a reference back to the master with instructions "to allow the complainants by way of profits realized by the defendant the difference between the cost & expense of spark-arresters & incident to the use thereof as compared with the cost & expense of the iron-bar-grate arresters used by the defendant in violation of the patent sued on & the incidents to their use." See opinion on exceptions, filed Sept. 27, 1889.

The finding & report of the master, filed June 8th, 1889, that
the defendant Co. made and used one hundred & eighty
562 (180) sets of the infringing spark-arresters at a saving of
$2.62 per screen or grate, amounting in the aggregate to the
sum of $471.60, having been approved by the court & acquiesced in by counsel, will not be further referred to except to bring the same forward in a statement of a total sum to be found for the complainant-.

Comparing the evidence of Lyon's testimony, Master's Record, Dec. 19 & 20, page 56, with the exhibits of the defendant Co., Kinsey's "statem't of cost of diamond stack" and "statement of cost of straight stack," both of Feb'y 18, '90, leaving out the screen from the one & the grating from the other, there is not much difference between them.

In the exhibits referred to the weight of iron after making the two stacks is nearly the same in each, that of the diamond stack being 455½ lbs. and that of the straight stack 451, a difference of only 4½ lbs. in favor of the straight stack, the straight stack being much less complicated in construction than the diamond stack, the bolts, braces, &c., of the one used in connection with the thin sheet or stove-pipe iron making up for the much heavier boiler iron and rivets of the other without the bolts & braces, but when the labor expended on the diamond stack is compared with that employed on the straight stack the difference is considerable in favor of the straight stack, being something more than one-half the diamond
stack, costing 82 hours of labor at $14.50¼, while the straight
563 stack cost 40 hours of labor at a cost of $6.09½, being a differ-
ence in favor of the straight stack of $8.40¾, to which add,
say, ten (10) cts. for difference of 4½ lbs. of iron in favor of straight stack, gives $8.50¾ gain to the def'ts on one stack, and it being con-

ceded that the defendant Co. made & used one hundred & twenty-eight (128) straight stacks with the infringing device during the period of infringement, gives the defendant a gain & profit of one thousand & eighty-eight & $\frac{96}{100}$ (1,088.96) dollars.

Again, in regard to the renewals of the wire-netting screen, Osborn, pgs. 42, '3, deps. of Dec. 19 & 20, puts the life of the wire netting at three (3) months, & Turner, dep. Dec. 19 & 20, page 69, puts it at six (6) months, & Tronson, dep. Dec. 19 & 20, at three (3) or four (4) months, & Stratton in his afd. in evidence puts it at twelve (12) months; Sanford in his afd., also in evidence, says, in substance, the average wear of the diamond stack is about one year, & that the wear of the netting in a diamond stack would not be near as long as the stack, it would cut out more rapidly; and now, taking Sandford at, say, six months, and the other four witnesses as given above, we have an average of six (6) months for the lifetime of the wire netting at a cost of \$2.14½, according to Kinsey's Exhibit "Cost of Diamond Stack," requiring to be renewed twice a year for three years, indicating a saving to the def't Co. of \$12.85 + on each of 128 stacks = \$1,645.44. See also Def't's Exhibits J. I. Kinsey, M. M., So. Easton, M'ch 8, '70, & diamond-stack model
for illustration of quantity of wire netting used in diamond-
564 stack screens, and item "1 p-us wire netting, 31, diam. 6¾
sq. ft.," Def't's Exhibit "Statement Cost of Diamond Stack,"
for cost of same.

It also appears from the evidence of Osborne, pages 42 & 43, Turner, page 69, & Tronson, page 102, deps. of Dec. 19 & 20, that it requires the time & labor of three men one hour at a cost of about twenty (20) cts. per hour to hoist off and put on the stacks when the wire netting is put on or renewed in the diamond stacks.

This is a further incidental gain and saving to the defendant company of sixty (60) cents an hour for each year on each of the 128 stacks for a period of three years, equal to \$1.20 on one stack for one year, and \$3.60 on one stack for three years, and \$460.80 on 128 stacks.

In regard to the lifetime of a diamond stack as compared with that of a straight stack, the complainant claims that one straight stack will last as long as two diamond stacks.

Osborne swears, deps. Dec. 19 & 20, page 44, that a diamond stack will run from twelve to fifteen months without repairs, Stratton says in his afd. thirteen months on an average, & Sandford says in his afd., both in evidence, that the life of a diamond stack is not more than one year, and that the average life of a straight stack is not less than four or five years.

From this evidence I conclude *that* the claim of the com-
565 plainant of one straight stack being equal to two diamond
stacks as at least fair to the defendant, & that from this another incidental gain of \$961.92 accrues to the def't. One straight stack, according to Kinsey's Exhibit Cost of Straight Stack Proper, without lift-pipe or grating, costs \$18.53, and a diamond sta*ch* proper, without lift-pipe or s*t*ark-arrester, costs \$16.78 at the shops of the def't Co. Kinsey Exhibit "Cost of Diamond Stack." This

favors the diamond stack by the amount of $1.75 in cost of construction, but, if one straight stack is worth two diamond stacks in endurance, in three years the def't has an advantage in the use of the straight stack over the diamond stack of $7.51½; on 128 stacks, $961.92.

I have not taken into consideration the difference in the cost of iron in the period of infringement and the time at which the Defendant's Exhibits "Statem'ts Cost of Diamond & Cost of Straight Stacks" were made, Oct. 22 & Nov. 7, 1889, for the reason that it appears to me that although the cost of iron was about one-third more during the period of infringement than it was in 1889, when these statements were made up, it would make either of these stacks cost more or less in about the same proportion.

I have not considered the additional cost of sheet brass, $3.68, in Defendant's Exhibit "Cost of Straight Stack for Passenger Engines," because it seems from the evidence of Kinsey, dep. June 25, '90, page 7, that this was entirely ornamental & did not serve any useful purpose.

566 I have considered and allowed the def't Co. for the Russia sheet iron for caseing the stacks, because it was useful for protecting the rougher surface of the sheet or stove-pipe iron in the diamond stacks and the rough boiler iron in straight stacks from the action of the elements, and served a useful purpose at a regular & not unreasonable cost, while the cost of brass or other material merely for ornament could be indefinitely extended accordingly as the gratification of the taste of the builder may have been extravigant or prudent. See Def't's Exhibit "Model of Straight Stack."

I have also allowed the cost of the top casting claimed in the Def't's Exhibits Costs of Stacks, because the defendants, I think, had a right to the use of such ornamentation as is reasonable within the line of such work of construction, and this item seems to be common as a top finish to all locomotive straight smoke-stacks. They are included in Strattan's estimate cost of straight stacks in his afd. at a cost of $4.61 and $3.74 in Kinsey's statement of cost, and the same may be said of what Strattan calls the "bottom ring" in his afd. at a cost of $1.82, and what Kinsey calls the "bottom casting" in his exhibit at a cost of $1.22, the one taking the place of the other in the two shops of the two companies.

I have followed the insistment of counsel that the defendant is entitled to the benefit of the cost of construction of these smoke-
stacks in this accounting, as the company made & used
567 them, so far as the materials and appliances seemed to serve
a useful purpose at a reasonable cost, within a line of expenditure common to this branch of railroad equipment.

I regard the amount allowed to the compl't in my first report, filed June 8, '89, $471.60, under the complainant's first claim for the difference between the cost of the cast-iron-grating spark-arrester & the rim-net stack screens previously used, $2.62, as direct gains and profit to the defendant company, and the other allowances as incidental.

Recapitulation.

Difference in cost of construction of stacks............	$1,088 96
Renewals of screens in diamond "	1,645 44
Saving of time & labor in renewals of stacks..........	460 80
Saving in durability of "	961 92
Amount found for compl't, 1st report.................	471 60
	$4,628 72

with interest on this sum of $471.60 reported in favor of the complainant & filed June 8, 1889, from this date, and interest on the sum of $4,157.12 from August 23, 1890, the day of the date of the filing of this supplemental report, which said sums I find & report against the defendant company in favor of the complainant.

All of which is respectfully submitted to the court.

S. D. OLIPHANT, *Master, &c.*

(Filed Aug. 23, 1890.)

568 United States Circuit Court, District of New Jersey.

Francis Kearney and Mary A. Tronson,
Compl'ts,
and
The Lehigh Valley Railroad Company,
Def'ts.

On Bill, &c. Exceptions to Master's Report.

The complainants hereby except to the second report of S. D. Oliphant, the master *pro hac vice*, to whom reference was made to ascertain and state an account of the damages resulting to them from the infringement by the defendant and the gains, profits, and advantages which the defendant had realized from the use of the infringing instrument, which report was filed the twenty-third day of August, eighteen hundred and ninety:

First. Because the master in estimating the difference in cost in the first construction of a diamond stack and a straight stack allowed on the straight stack for a top casting, casing, and bands, and the labor thereon, when said items were for ornamentation alone and served no purpose in the use of said stack.

Second. Because the master did not charge the defendants with the difference (found by the master to be about $\frac{1}{3}$) between the cost of material during the time of the infringement and the cost
569 in 1889, when the statements of costs were made up by the defendants upon which the master based his calculation.

Third. Because the master failed to allow the difference in cost of lift-pipe for the two stacks in the first construction, which at the cost of material at the time of the infringement amounted to three dollars and thirteen cents on each of the one hundred and twenty-eight locomotives.

Fourth. Because the master only found one renewal of the diamond stack necessary at an advantage of \$7.51½ on each of 128 stacks, when he should have found that an average of two renewals of diamond stacks were necessary on each of one hundred and twenty-eight locomotives, at a cost for each (including the higher cost of material) of at least twenty-eight dollars and thirty-six cents, and should have allowed said cost, amounting to seven thousand two hundred sixty dollars and sixteen cents, instead of the sum of nine hundred sixty-one dollars and ninety-two cents, as stated in his said report.

ELWOOD C. HARRIS,
Sol. of Compl'ts.

(Filed Sept. 3, 1890.)

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570 United States Circuit Court, District of New Jersey.

KEARNEY and TRONSON
vs.
THE LEHIGH VALLEY RAILROAD CO.

Defendant's Exceptions to Master's Second Report.

The defendant hereby excepts to the second report of S. D. Oliphant, the master, to whom reference was made to ascertain and state an account of the damages resulting to complainants from the infringement by the defendant and the gains, profits, and advantages which the defendant had realized from the use of the infringing device, which report was filed the 23rd day of August, 1890:

1. Because the master in estimating the difference in the original cost of the two devices did not include the cost of all the parts shown to be embodied in their construction as the same were made and used by the defendant.

2. Because he has entirely omitted the original cost and cost of repair of the cast-iron screen used in connection with the straight stack.

3. Because in estimating the cost of renewals of the wire-netting screen for the diamond stack he charges a renewal once in every six months instead of once every twelve months.

571 4. Because in calculating the cost of said wire screens on the basis of once in every six months he has charged renewals six times in three years instead of five times.

5. Because in estimating the cost of renewals of the stacks he finds that one straight stack is equal to two diamond stacks, and charges the defendant with the cost of two sets of diamond stacks in three years.

6. Because of the allowance of interest before final decree.

These exceptions are made without prejudice to defendant's motion, on record, to strike out all evidence as to cost of locomotive stacks, and that the complainants are entitled to nominal damages only.

ANDREW McCALLUM,
Solicitor for Defendant.

(Filed Sept. 16, 1890.)

572 Circuit Court of the United States, District of New Jersey.

Francis Kearney and Mary F. Tronson
v.
The Lehigh Valley Railroad Company.

On Bill & Decree, &c., &c.
On Exceptions to Master's Supp. Report.

Opinion by **Bradley**, *J.*:

The master has made a supplemental report in this case, filed 23rd of August, 1890, pursuant to the order made on the 27th of September, 1889, and both the complainants and the defendant have filed exceptions thereto. The report is in favor of the complainants for the sum of $4,628.72, made up of five different items of profit realized by the defendant by the use of the patented invention of the complainants, to wit, the cast-iron grate for screening the cinders in the smoke-stacks of their locomotives. It is conceded that the invention was placed and used by the defendants on 128 straight stacks in different years from 1878 to the commencement of the suit in 1883. It was applied to 1 locomotive in 1878, to 64 in 1879, to 17 in 1880, to 14 in 1881, to 17 in 1882, and to 15 in 1883—to 128
in all. The items of profit allowed by the master were: 1st,
573 $1,088.96 on the saving in the original cost of the stacks, irre-
spective of the wire-net screen in the diamond stacks and the cast-iron grating in the infringing stacks; 2nd, $1,645.44 for the cost of removing the wire-net screens, saved by the use of the cast-iron grates; 3rd, $460.80 for the saving of time and labor in taking down the stacks and adjusting therein the screens so removed; 4th, $961.92 for the gain in the greater length of time that the cast-iron grates and straight stacks lasted, and, 5th, $471.60 gained in the difference of cost between the wire-net screens which were placed in the smoke-chamber and the cast-iron grates. This last item is conceded to have been wrongly allowed, inasmuch as the wire screens in the smoke-chamber were abandoned by the defendants as an unsuccessful experiment.

After a careful examination of the exceptions filed by the respective parties and in reference to the evidence referred to by them and by the master I am satisfied that the report ought to be modified in some respects, and without taking up the exceptions seriatim I will proceed to state the manner in which I think the account should be
made up and the result produced so as to save the parties the
574 trouble of further reference and discussion in the master's office
and to enter a final decree in the case.

I think the master is right in determining that the straight stacks, with the infringing device of cast-iron grates, last at least twice as long as the diamond-top stacks, with wire-net screens, which the decretal order of September last directed to be taken as the basis of comparison. The weight of evidence, indeed, is that they last more than twice as long: that the diamond stacks last, on an average, but little more than one year or a year and a half, whilst the straight stacks last at least three or four years. Therefore we may assume that when the defendants used one of the infringing straight stacks with cast-iron grates for a year and a half or more they would have had to renew the diamond stack at least once, and when they used one of the straight stacks for three years they would have had to renew the diamond stack at least twice. Further, the wire-net screens in the diamond stacks would, according to the weight of the evidence, have to be renewed at least once and probably twice during the lifetime of the diamond stack itself.

Again, the difference of cost of iron from 1879 to 1883 and
575 in 1889, when the experiments were made which are relied
on to show the cost of construction, is an item which cannot be properly neglected.

I think the master was right in allowing the defendants the cost of the Russia sheet-iron casing which they placed upon the straight stacks to prevent corrosion and to improve the appearance of the stacks. This was a fair expense, incurred in good faith, and tended to diminish the actual profits realized by the use of the infringing device. He was also right, in my judgment, in disallowing the ornamental brass bands which the defendants placed on the stacks used for their passenger cars. These bands were used merely for ornament, as a matter of taste and luxury, and were not used on the diamond stacks. The complainant contends that the Russia iron sheeting was used as a substitute for the paint which was placed on the diamond stacks, and should be regarded as an offset against said paint; but we have no estimate of the cost of painting, and therefore no basis of comparison. Besides, the sheet iron was undoubtedly an improvement which the defendants had a right to
use and charge to the cost of the stacks. It diminished the
576 profit which they actually realized.

With these remarks I proceed to state what seems to me a proper account of the profits to be charged to the defendants. I take as the basis the defendants' statements made by Mr. Kinsey, their foreman, from the actual cost of two experimental stacks constructed by the defendants in 1889, and shall apply such other evidence as seems to be pertinent:

The cost of a diamond stack, including wire net and lift-pipe, is shown to be	$32 24
128 stacks would have cost	$4,126 72
96 of these made prior to 1882 would have had to be renewed, costing	3,095 04
25 per cent. additional cost of iron over cost in 1889, to wit, $4.58 each, is	1,025 92
2 new sets of wire screens for the first 96 stacks and 1 new set, on the average, for the residue, viz., the 96 new ones & 32 others, 320 new sets in all, at $4.40 each	1,408 00
Labor of taking down stacks and adjusting said new screens, 320 in all, at 60 cts. each	192 00
Total	$9,847 68

577 Total		$9,847 68
The cost of 128 straight stacks, with cast-iron grates & lift-pipes	24 14	
25 % additional cost of iron, being $4.08 for each stack	4 08	
	28 22	
For 128 stacks total is		3,612 16
Profits realized by defendants		$6,235 52

A decree will be made for this amount.

J. P. BRADLEY,
Circ. Justice.

(Opinion on exceptions to supplemental report. Filed Sept. 25, 1890.)

578 Circuit Court of the United States for the District of New Jersey.

Francis Kearney & Mary F. Tronson
v.
The Lehigh Valley Railroad Company.
} On Bill, &c. Final Decree, Sept. 25th, 1890.

This cause coming on to be heard upon exceptions of the complainants and defendant to the master's supplemental report filed August 23rd, 1890, and the court, having considered of the same, doth order and decree that the said report be modified and the account of profits restated as follows, to wit:

The cost of a diamond stack, including wire net & lift-pipe, is shown to be $32.24; 128 stacks would have cost	$4,126 72
96 of these, made prior to 1882, would have had to be renewed, costing	3,095 04
25 per cent. additional cost of iron over cost in 1889, to wit, $4.58 each, is	1,025 92
2 new sets of wire screens for the first 96 stacks & 1 new set, on the average, for the residue, viz., the 96 new sets & 32 others, 320 in all, at $4.40	1,408 00
Labor of taking down stacks & adjusting said 320 new screens, at 60 cents each, is	192 00
	$9,847 68

579 The cost of one straight stack with cast-iron grate & lift-pipe is	$24 14	
25 per cent. additional cost of iron, being $4.08 for each stack	4 08	
Makes total cost of each stack	$28 22	
128 straight stacks at $28.22 is		3,612 16

Showing that the cost to the defendant of diamond stacks and wire net during the period of infringement would have been	$9,847 68
Whereas the cost of the straight stacks and cast-iron grates was only	3,612 16
Making a profit of...........................	$6,235 52

And the court being of opinion that the defendant, by the use of the invention secured by the patent of the complainants, did make and realize a profit of six thousand two hundred and thirty-five dollars and fifty-two cents, it is thereupon ordered, adjudged, and decreed that the defendant, The Lehigh Valley Railroad Company, do pay to the complainants the said sum of six thousand two hundred and thirty-five dollars and fifty-two cents and the costs of suit, to be taxed.

September 25th, 1890.

JOSEPH P. BRADLEY,
Circuit Justice.

(Endorsed:) U. S. circuit court, dist. of N. Jersey. Kearney & Tronson *vs.* The Lehigh Valley R. R. Co. Final decree, Sept. 25, 1890. Filed Sep. 25, 1890. S. D. Oliphant, clerk.

580 UNITED STATES OF AMERICA, } *ss:*
District of New Jersey, }

I, S. D. Oliphant, clerk of the circuit court of the United States for the district of New Jersey, do hereby certify that the foregoing is a full, true, and complete transcript of the record in the suit of Francis Kearney *et al.* against The Lehigh Valley Railroad Company as the same remains on file and of record in my office.

In testimony whereof I have hereunto set my hand and affixed the seal of said court, at Trenton, in said district, this twenty-eighth day of September, A. D. 1891.

[The Seal of the U. S. Circuit Court, Dist. of New Jersey.]

S. D. OLIPHANT, *Clerk.*

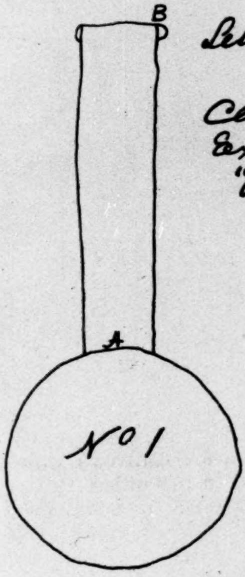
581 *Statistics in Suit Kearney and Tronson vs. Lehigh Valley R. R. Co.*

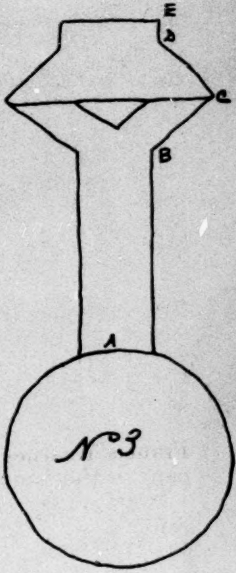
	1878.	1879.	1880.	1881.	1882.	1883.	Total number of screens.
Locomotives equipped with screens..................	1	64	17	14	17	15	128
Screens worn out and replaced..................	[In pencil:] No account kept of this.						

U. S. Circuit Court
Dist. of New Jersey

Kearney et al
vs.
Lehigh V. R. R. Co.

Complainants
Exhibit
"Boiler Stacks"
S. D. O. Master
Feby. 7. 88





S. D. O.
Feby. 7. 88
"Boiler stacks"

No. 314
Lehigh Valley R R Co } p. 582
v
Kearney et al

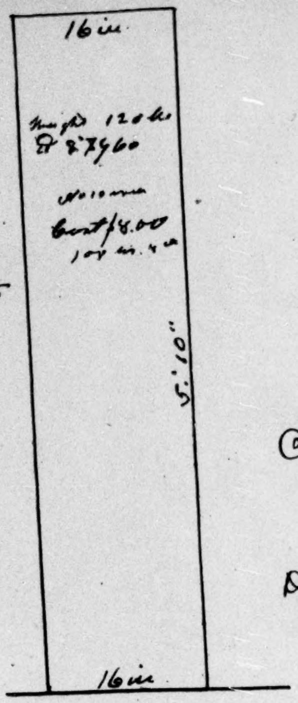
583

Kearney
vs
L.V.R.R. }

Complainants
Exhibit Figures
Diagram

Dec-19/88 S.D.O.
Mr.

No 314
Lehigh Valley
R R Co
v
Kearney et al } p 583



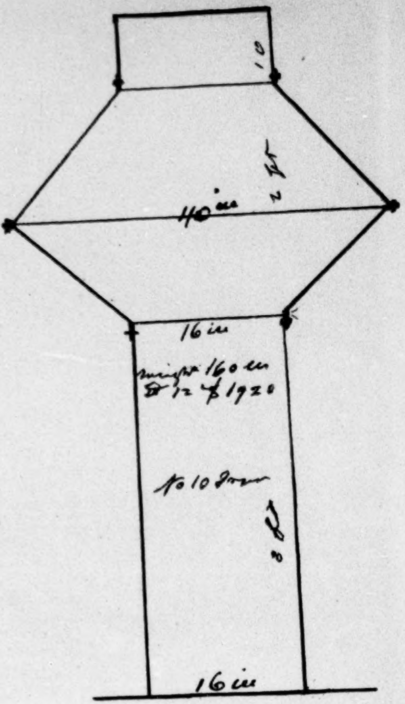
1

U.S. Cir. Ct
Dist N.J.

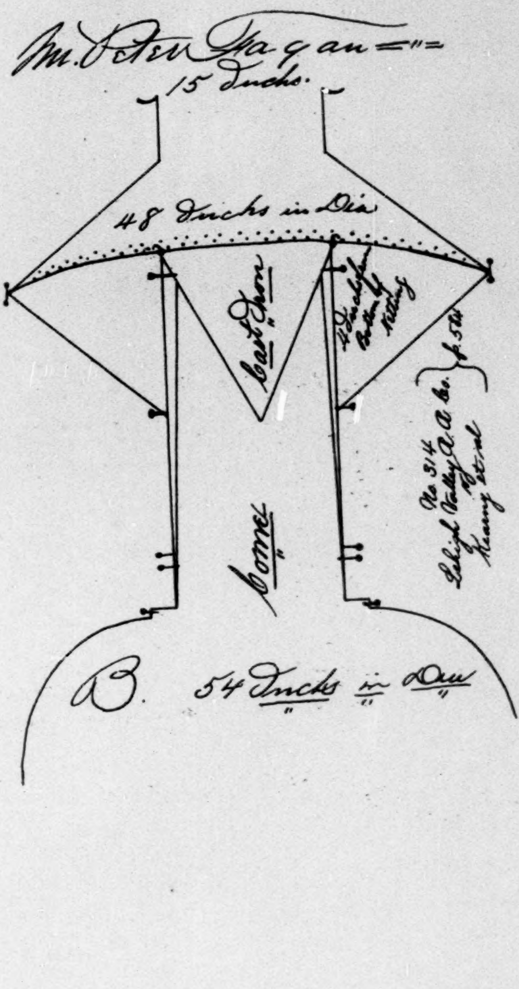
Kearney
v
L.V.R.R. Co

Complainants
Exhibit Figures
Diagrams.

Dec- 9/88



Scale 1 ft to 1 inch about



U. S. Cir Ct
Dist N. J

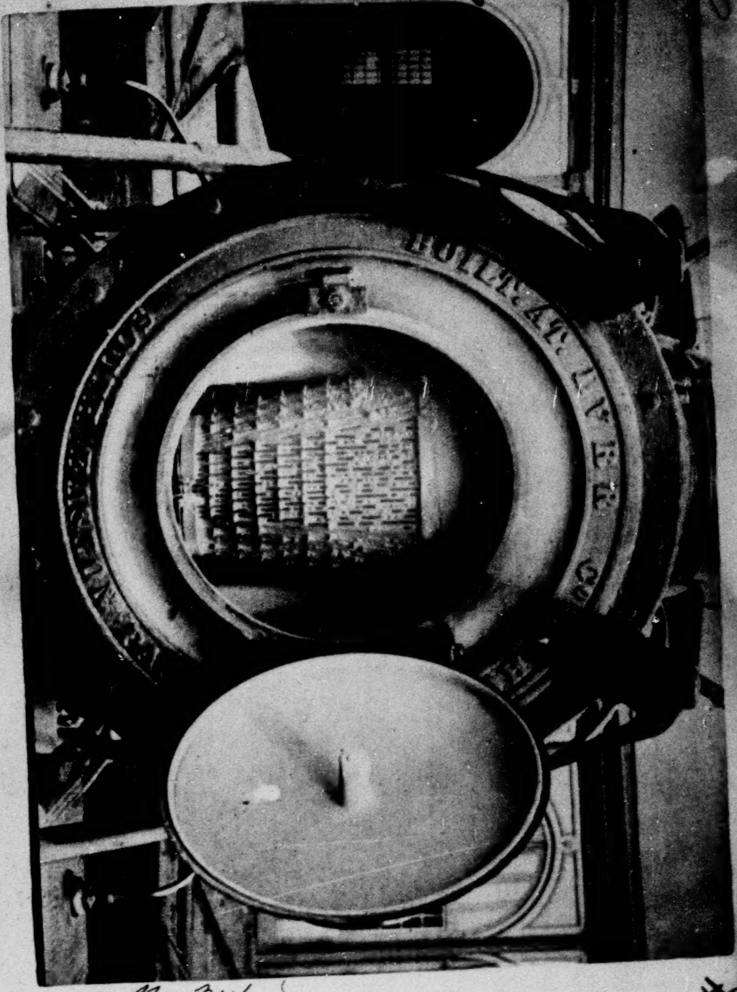
Kearney
v
L. V. R.R. Co

Complts Exhibit Fagan Stack
Dec 19/88.
S. D. O. Mr.

586

Defendant's Exhibit "B"

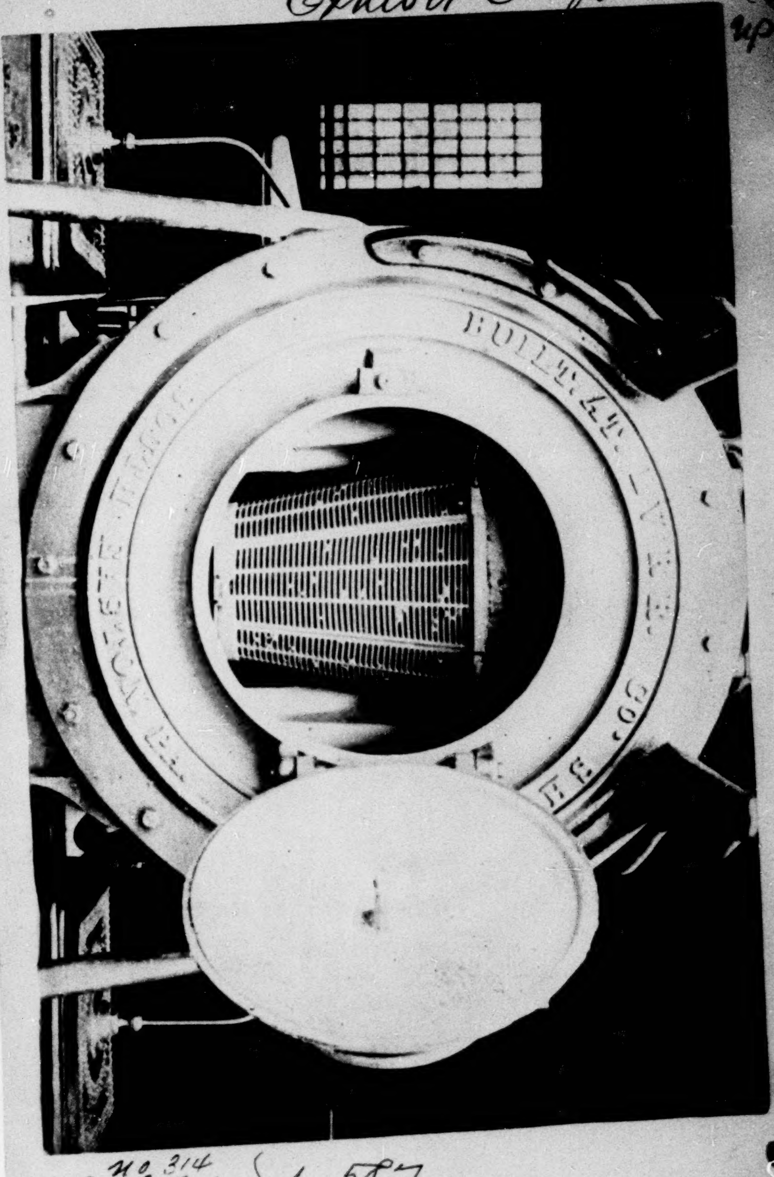
John B. Noble
Notary Public



No 314
C U R R Co
v
Kearney
} p. 586

#1

~~Exh~~ "Defendants' 587 Ex
Exhibit C" John S Noble
up

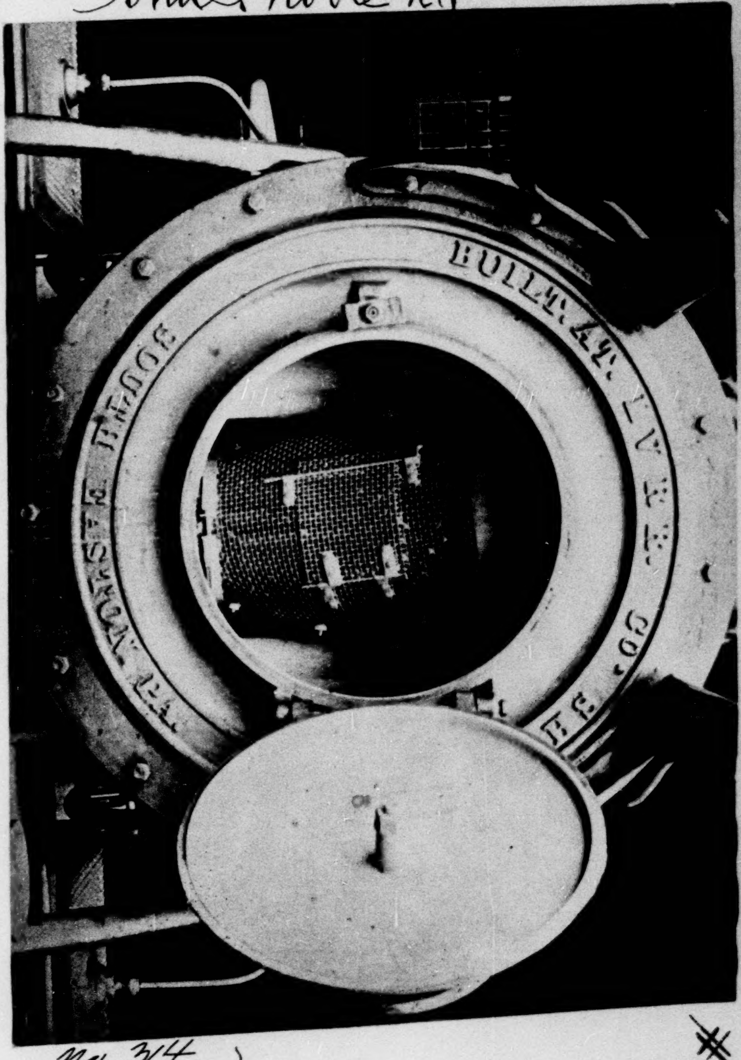


No 314
LVRRCo } p. 587
"Hearing"

#3

588 Ex D

"Defendant's Exhibit D"
John B. Noble N.P.

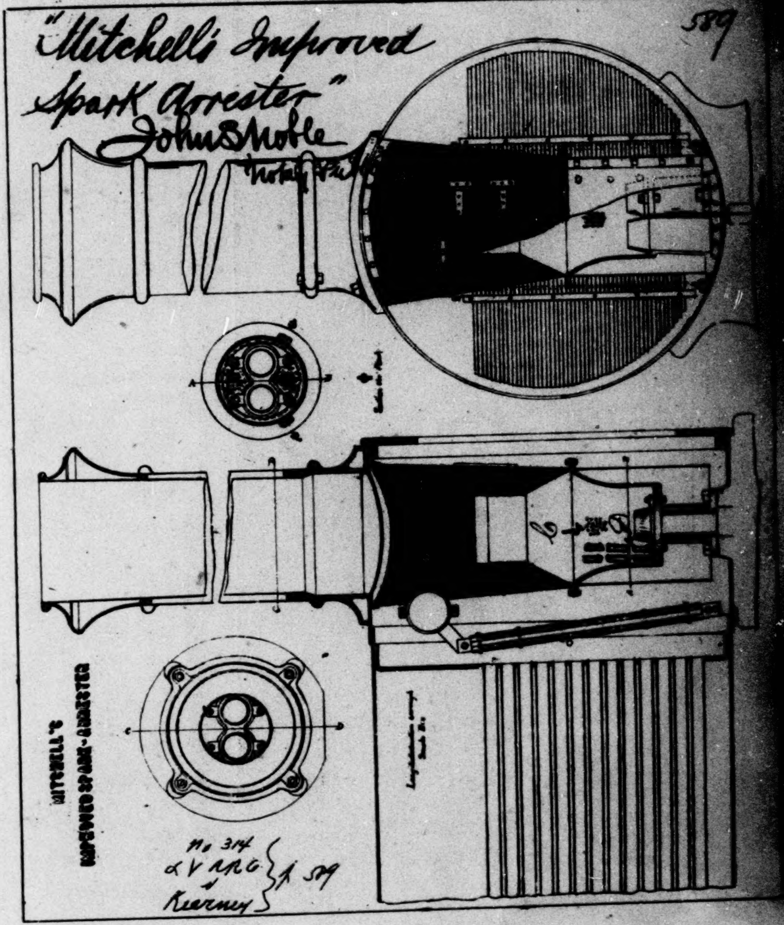


No 314
L V R R Co
v
Kearney } p 588

2

589

"Mitchell's Improved
Spark Arrester"
John S Noble
Notary Pub



No 314
C V R R Co
v
Kearney } A 589

No 314
L V R R Co } p 590
Kearney

"Mitchells Spark Arrester
Drawing No 3."
John S. Noble
Notary Public

Drawing "No 3"

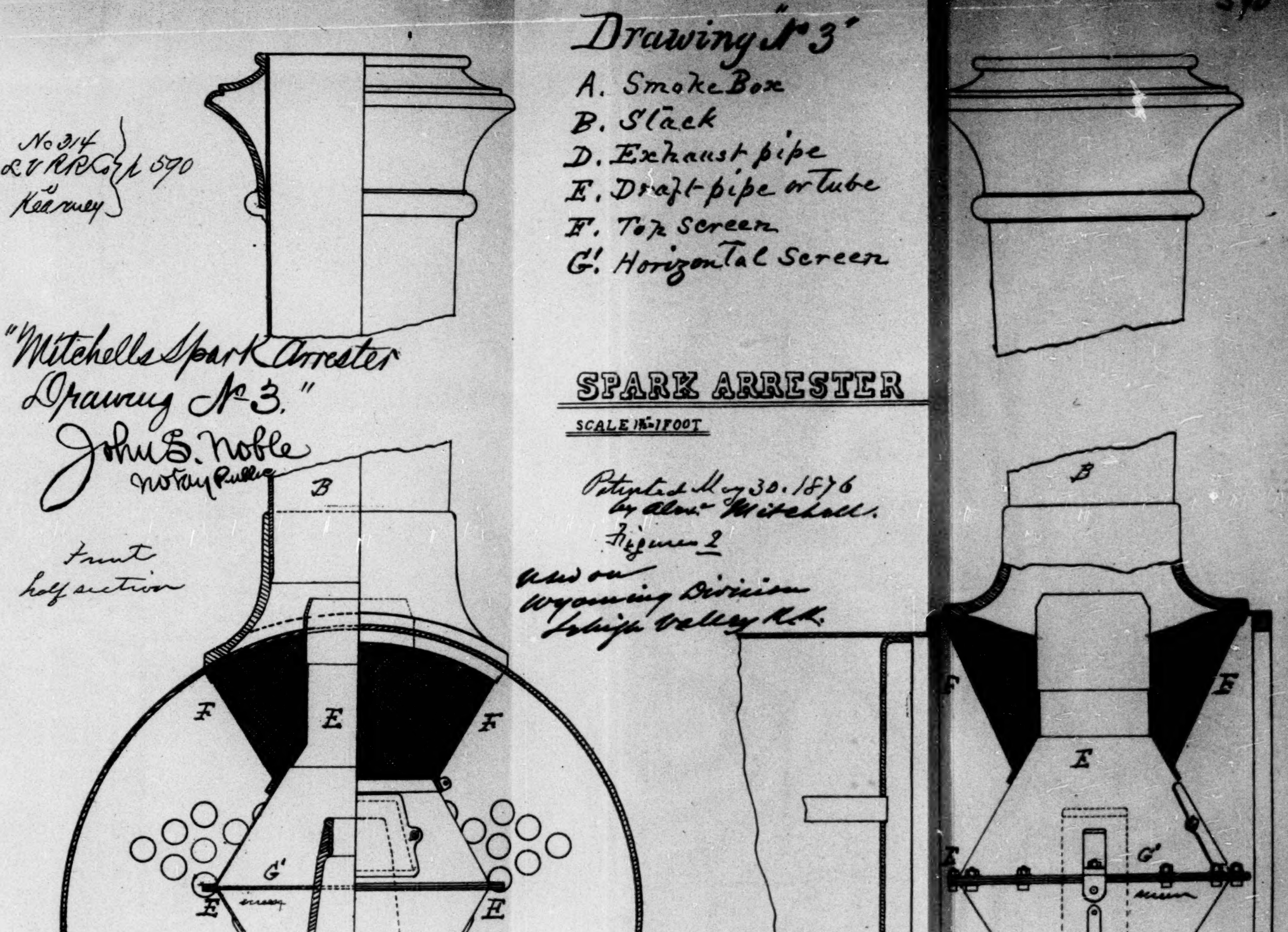
A. Smoke Box
B. Stack
D. Exhaust pipe
E. Draft-pipe or tube
F. Top screen
G'. Horizontal Screen

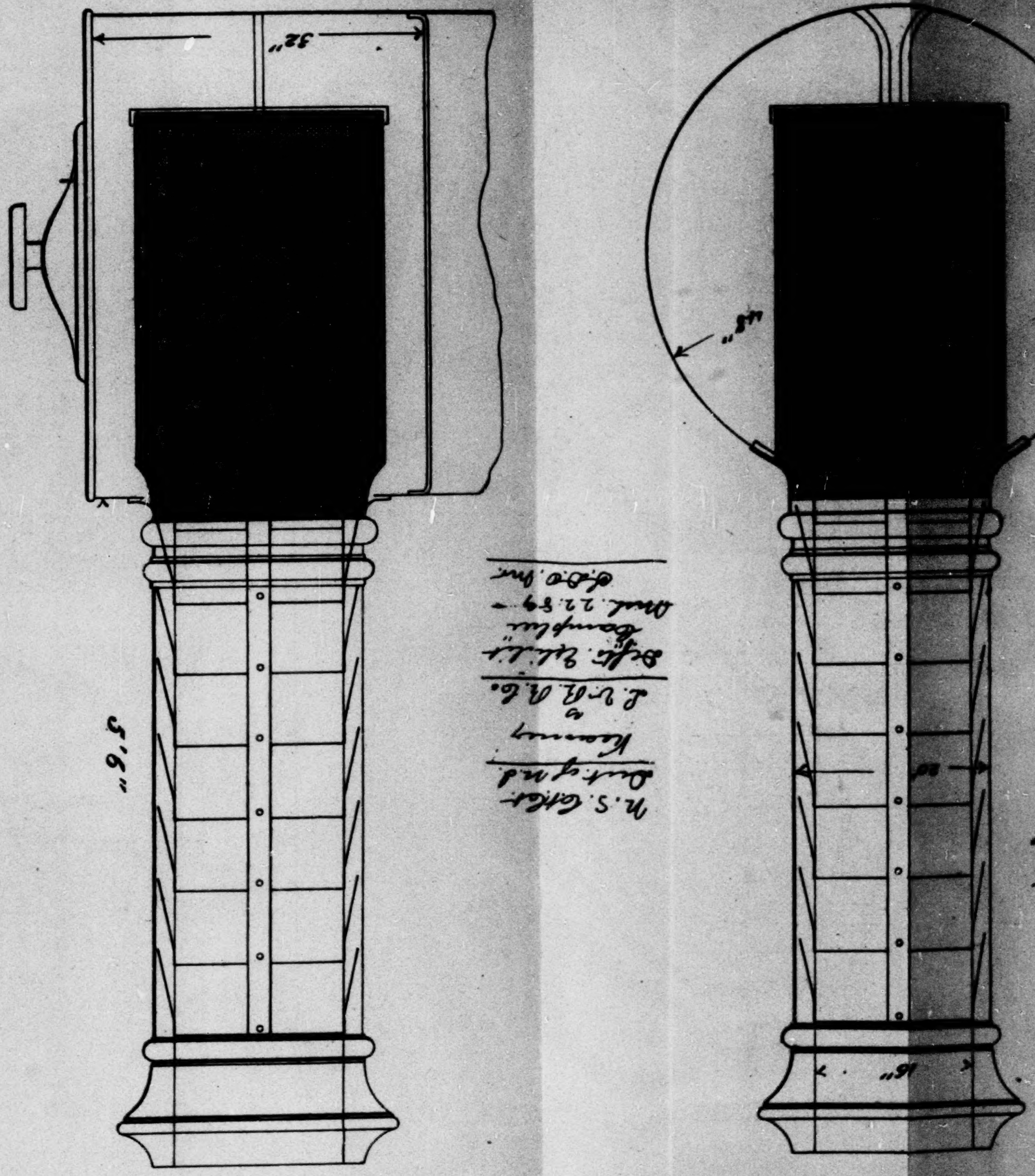
SPARK ARRESTER

SCALE 1½"=1 FOOT

Patented May 30. 1876
by Alexr Mitchell.
Figures 2

Used on
Wyoming Division
Lehigh Valley R.R.



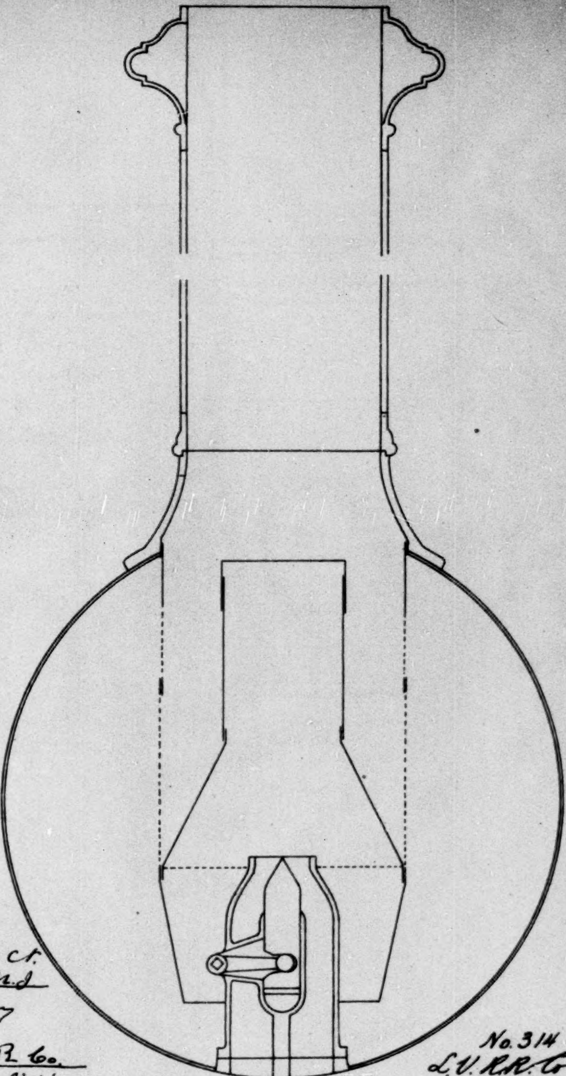


U.S. Ct. Ct.
Dist. of N.J.

Kearney
v
L.V.R.R.Co.

Defts. Exhibit
"Camplin"
Mch. 22. 89 —
S.D.O. Mr.

No. 314
L.V.R.R. Co
v
Kearney } p. 592.



U.S. Ct. Ct.
Dist. of N.J
Kearney
vs
L.V. R. R. Co.
Defts. Exhibit
"Clark"
Mch. 22. 89
S.D.O. Mr.

No. 314
L.V. R.R. Co
v
Kearney
p. 593

Spark Arrestor

Hazleton Shops. Hazleton Div L.V.R.R.

November 1883

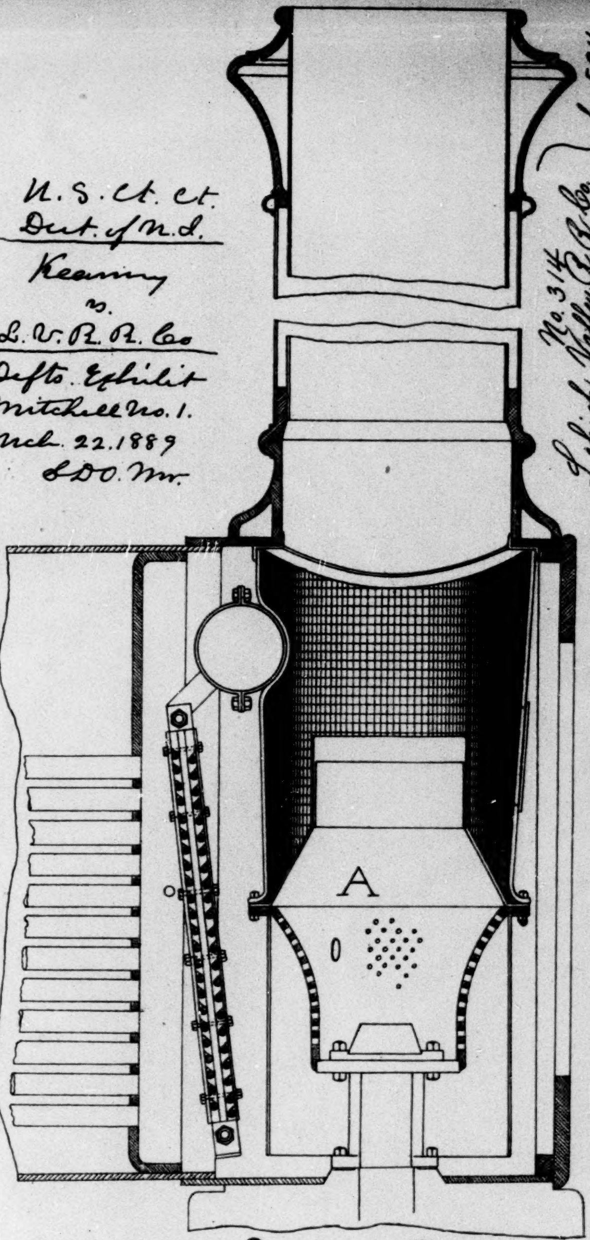
U. S. Ct. Ct.
Dist. of N. J.

Kearny
vs.
L. V. R. R. Co

Defts. Exhibit
Mitchell No. 1.
Mch. 22. 1889
SDO. Mr.

No. 314
Lehigh Valley R. R. Co.
&
Kearny et al

p. 594.



Spark-Arrester.

Wilkes-Barre Shops
Wyoming Division L. V. R. R.

U.S. Ct. Ct.
Dist. of N.J.

Kearney
vs
L.V.R.R. Co

Defts. Exhibit
"Hoffecker"
March 22, 87
O.D.O. Mr.

No 214
L V R R Co
v
Kearney
} p. 57.

Weatherly Shops Pa

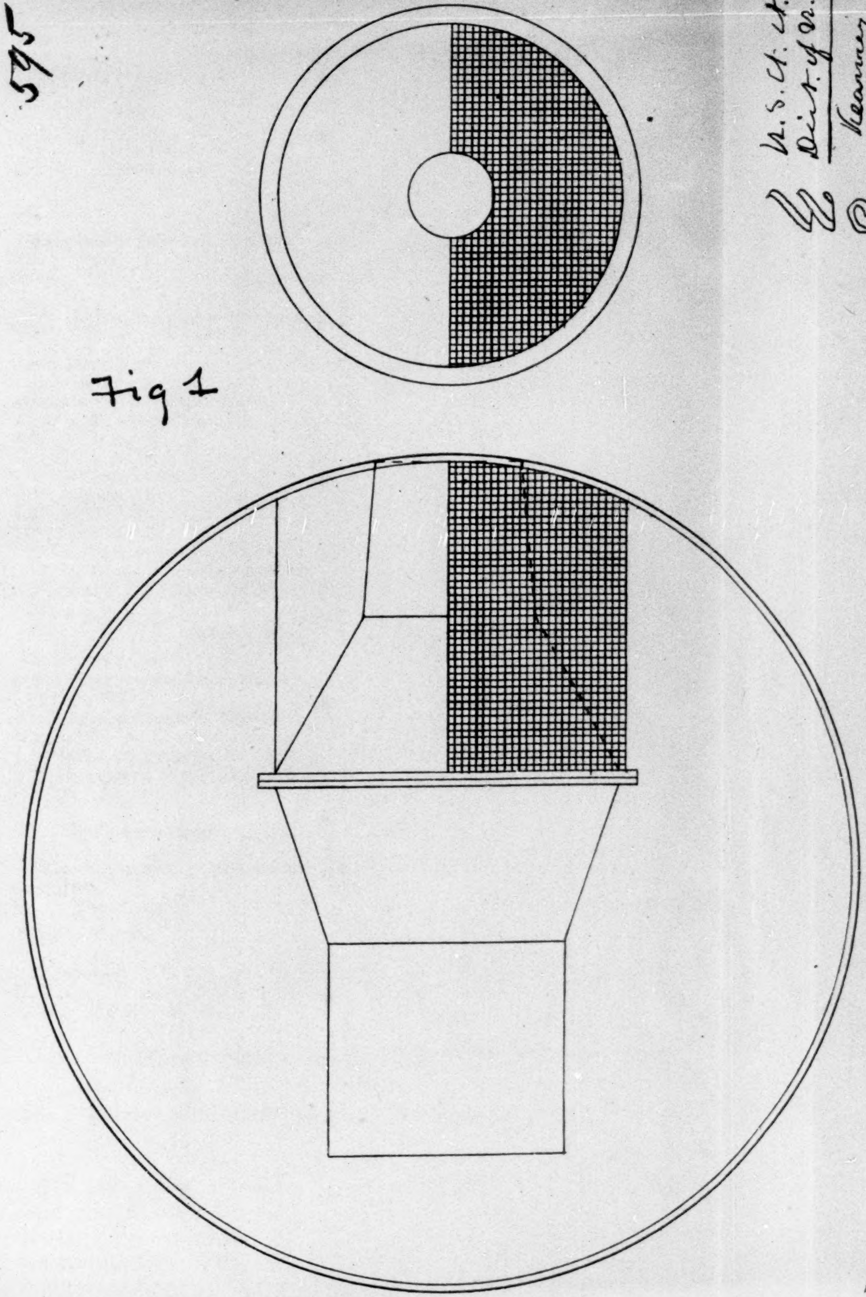


Fig 1

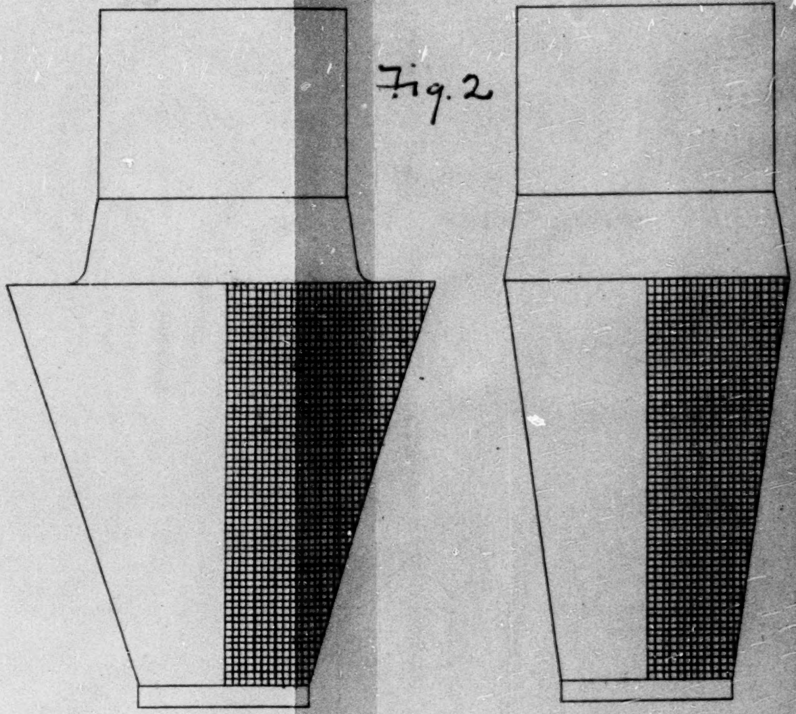


Fig. 2

Vertical Cast-iron Screens Made at South Easton Shops.

December,	1878	6 pieces.
	1879	462 "
	1880	162 "
	1881	154 "
	1882	190 "
April,	1883	107 "
		1,081 "

[In pencil:] This includes all such for construction & renewal.

6 segments required to form complete screen. Above 1,081 p'ces equal to 180⅙ sets.

Itemized Cost of Wire-net Stack Screen.

Labor, cutting & bending screen.
" " & " 1/16″ iron for sides of screen & making bands:

John Denninger, 2 hrs. @ 17½	35	
Jacob Bernhart, 2 " 13	26	
Punching holes, Fred. Seible, ½ " 16^2	08	
13 sq're ft. wire screen, 27	3 51	
5 lb 1/16″ iron, 5½	28	
5 " ⅛″ x 1″ iron for bands, 3	15	
½ " ¼″ iron rivets, 7½	04	
½ " ½ bolts, 3½	02	
¼ " ⅜″ " 3½	01	
1 " iron lugs, 3	03	
Drilling lugs & bands, Ellsworth Case, 1 hr., 12	12	
Making 4 lugs, Christian Rausch, 2 " 20	40	
6 ½″ bolts & 2 ⅜″ bolts, Wellington Case, 2 " 12	24	
		$5 49

Itemized Cost of Vertical Cast-iron Stack Screen.

5 lb ⅛″ x 1″ iron for bands, 3	15	
½ " ¼″ iron rivets, 7½	04	
1 " lugs, .03	03	
Drilling lugs & bands, Ellsworth Case, 1 hour, 12	12	
Making 4 lugs, Christian Rausch, 2 " 20	40	
6 ½″ bolts & 2 ⅜″ bolts, Wellington Case, 2 " 12	24	
6 C. I. segment of screens, 54 lb, 3½	1 89	
		2 87
Difference in cost		2 62

Wire-net screen put in during Aug., 1886, in use Jan'y 27th, 1888, and in good condition.

You- truly, J. I. KINSEY, *M'n.*

Jan'y 30, '88.

[Endorsed:] U. S. circuit court, dist. of New Jersey. Kearney *et al. vs.* L. V. R. R. Co. Comp'ts' Exhibit "Kinsey's Statement of Cost." S. D. O., m'r. Feb'y 7, '88. P'g 50. M. R.

(Here follow diagrams marked pp. 582 to 595.)

596 School of Mechanical Engineering, the Lehigh University.

BETHLEHEM, PA., *Mar.* 6, '89.

MY DEAR MR. KINSEY: Yours of the 4th inst. just received. I send you at once the record of the Bulkley pyrometer for the particular days on which the boiler tests were most complete, because the results then found corroborate the indications of the pyrometer. The terms upper & lower here used refer to position of pyrometer in upper & lower half of flue area of smoke-box respectively. The pyrometer readings are in degrees of temperature, and represent the average of the readings taken while throttle valve of engine was open.

July, 1887. Date	1st.	8th.	13th.	2nd.	9th.	11th.	12th.	14th.
Kind of train	Special passenger.	Express.	Express.	Local.	Express.	Local.	Local.	Coal.
Kind of coal used	Middle Lehigh.	Middle Lehigh.	Middle Lehigh.	Park.	Highland	Highland	Highland	Highland
Readings of upper pyrometer	....	....	966°	....	....	....	986°	920°
Readings of lower pyrometer	834°	916°	....	814°	950*	974°		

Yours sincerely, J. F. KLEIN.

[Endorsed:] U. S. c't c't, dist. of N. J. Kearney *vs.* L. V. R. R. Co. Def't's Exhibit "Klein's Report." M'ch 22, '89. S. D. O., m'r.

597 *Actual Cost to Make One Loco. Diamond Stack.*

1889.					
Oct. 22.	14	lb W. iron braces, 3	42 √		
	2½	" 25⅜″ bolts, nuts, & washers, 3	7½ √		
	273	" #10 iron, 3½	9 55½		
14 lb,	1	p'ces wire netting, 31″ diam., 6¾ sq. ft., 27	1 82¼ √		
	4	lb rivets, 8	32		
	45	" top castings, 2	90 √		
	44	" bottom castings, 2	88		
	25	" top ring, 2	50 √		
	34	" inside cone, 2	68 √		
	*442½		*15 15¼	15 15¼	
	27¾	hrs. labor, form'g & rivet'g, Jos. Clark, 24	6 66		
	27¾	" " " " John Collins, 12	3 33		
	1	" " punching, Geo. Budder, 16½	16½		
	1	" " drill press, E. Kline, 13	13		
	½	" " cutting bolts, John Wagner, 16½	8¼		
	2	" " blacksmith, A. Shneder, 24	48		
	2	" " " R. Major, 12½	25		
	1½	" " cone braces, J. Kemmerer, 14	21		
	1½	" " " " C. Keiper, 12	18		
	3	" " castings, S. Merwarth, 22½	67½		
	*68			12 16¼	
				$27 31	
		Cr. by scrap, 80 lb, ¾		60	26 71

Weighed after making, 455½ lb.

Deduct from above that which appertains to spark-arrester in diamond stack:

14 lb W. iron braces, 3	42	
2½ " (25) ⅜″ bolts, nuts, & washers, 3	7½	
1 p'ces wire screen, 31″ diam., 6¾ sq. ft., 27	1 82¼	
45 lb top castings, 2	90	
25 " " ring, 2	50	
34 " inside cone, 2	68	4 40
Diamond stack without screen cost		$22 31

[* In pencil in copy.]

Lifting Pipe for Diamond or Cone Stack.

68 ℔ # 10 iron, 3 5/16	2 38
1 " ¼ iron rivets	07
James Clark, 5 hrs., 24	1 20
John Reese, 5 " 12	60
17 ℔ ⅜″ x 2″ iron for braces, 4	68
1½ " ½″ x 1½ " bolts & nuts, 4	06
Jacob Kemmerer, 2 hrs., 15	30
Chas. Keiper, 2 " 12	24
	$5 53
	*26 71
	*32 24

Page 99. Oct. 29, '89.

[Endorsed:] U. S. circuit court, dist. of New Jersey. Kearney *vs.* L. V. Railroad Co. Def't's Exhibit "Statement of Cost of Diamond Stack." S. D. O., m'r. Feb'y 18, '90.

598 *Cost to Make One Straight Stack for Freight Engines.*

1889. Cost to make one (1) straight stack for freight engines:

Nov. 7th.	8 lbs. #20 com. stove-pipe iron for bands, √ 05	40	
	2 hours, tinsmith, " " √ 19	38	
	47 lbs. #16 iron " casing, √ 3 7/16	1 74	
	2 hours, bending, drilling, & riveting, Jas. Clark, for casing, 24	48	
	2 hours, bending, drilling, & riveting, J. Collins, for casing, 12	24	*2 46
	144½ lbs. #10 iron for body, 3½	5 05½	
	3½ " rivets " " 8	28	
	9¼ hours, bending & riveting, Jas. Clark, for body, 24	2 22	
	9¼ " " " J. Collins, " " 12	1 11	
	2 " drilling, Elmer Kline, " " 13	26	
	187 lbs. top casting, 2	3 74	
	61 " bottom casting, 2	1 22	
	3½ hours on outside of casting, S. Merwasth, 22½	79	
	3½ " " " " 22½	79	
		18 70	
	Less 22½ lbs. #10 scrap, ¾	17	
		$18 53	
	* Lift pipe	*2 74	
	* Grating	*2 87	
		*24 14	

Weight after making, 451 lbs.

Straight stack for pass. engine will cost $3.23 more, as follows:

8 lbs. #20 sheet brass for bands, 40	3 20	
2 hours, tinsmith, " " 19	28	
½ " Wilkes Barre shop, for bands, 20	10	*3 68
15 lbs. #24 jacket iron for casing, 10	1 50	
3 hours, tinsmith, " " 19	57	*2 07
	5 75	
Straight stack for freight, items marked thus √ am'nt to	2 52	
Difference	$3 23	

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* [In pencil in copy.]

Lifting Pipe for Straight Stack.

43½ lb #13 iron, 3$\frac{5}{16}$	1	51
½ " ¼″ " rivets, 7		03^2
1 " ⅝ x 1½ iron bolts & nuts		04
John Denninger, 3 hrs., 17½		52½
John Reese, 3 " 12		36
5 lb ⅜ x 2″ iron for braces, 4		20
Jacob Kemmerer, ¼ hour, 15		04
Chas. Keiper, ¼ " 12		03
	$2	74

[Endorsed:] U. S. circuit court, dist. of New Jersey. Kearney *vs.* Lehigh Valley R. R. Co. Def't's Exhibit "Statement of Cost Straight Stack." S. D. O., m'r. Feb'y 18, 1890.

599 *Statistics in Suit Kearney and Tronson vs. Lehigh Valley R. R. Co.*

		1878.	1879.	1880.	1881.	1882.	1883.	Total number of screens.
1888. Jan'y 30.	Locomotives equipped with C. I. screens...	1	64	17	14	17	15	128
	C. I. screens worn out & replaced..........							

Vertical C. Iron Screens Made at South Easton Shops.

December,	1878	6	p'ces or segments.
	1879	462	" "
	1880	162	" "
	1881	154	" "
	1882	190	" "
April,	1883	107	" "
		1,081	" "

6 segments required to form 1 complete screen; 1,081 segments equals 180⅙ set-.

Itemized Cost to Make One Wire-netting Screen as Used in Straight Stack.

Labor, cutting and bending wire netting.
" " " " $\frac{1}{16}$ iron for sides of screen and making bands:

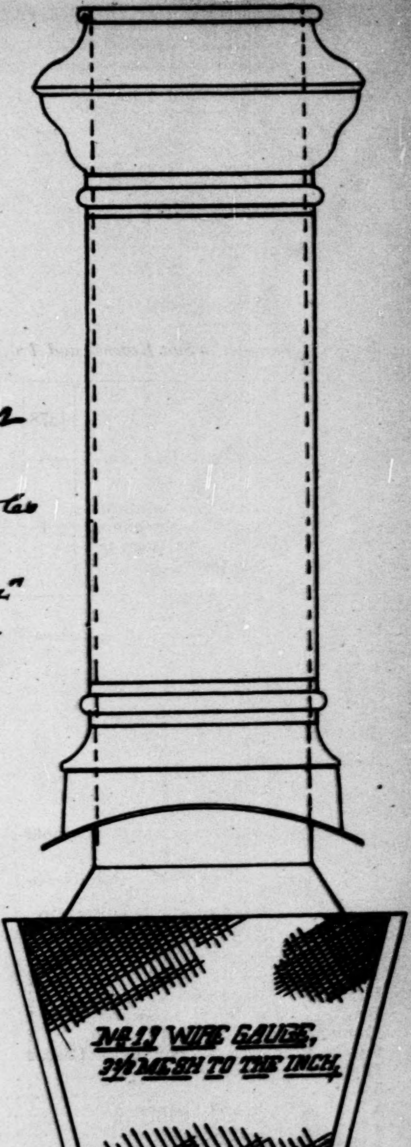
John Denninger,	2 hrs. @	17½	35	
Jabob Bernhart,	2	13	26	
Punching holes, Fred. Seibel;	½	16½	08	
Drilling lugs & bands, Ellsworth Case,	1	12	12	
Making 4 lugs, Christian Rausch,	2	20	40	
6 ½″ bolts, 2 ⅜″ bolts, Wellington Case,	2	12	24	
13 ft. wire netting, 27.			3 51	
5 lb $\frac{1}{16}$ iron. 5½			28	
5 " ⅛″ x 1″ iron for bands, 3			15	
½ " ¼ rivets, 7½			04	
½ " ½ bolts, 3½			02	
¼ " ⅜ " 3½			01	
1 " lugs, iron, 3			03	
				5 49

U. S. Circuit Court
Dist. of N. J.

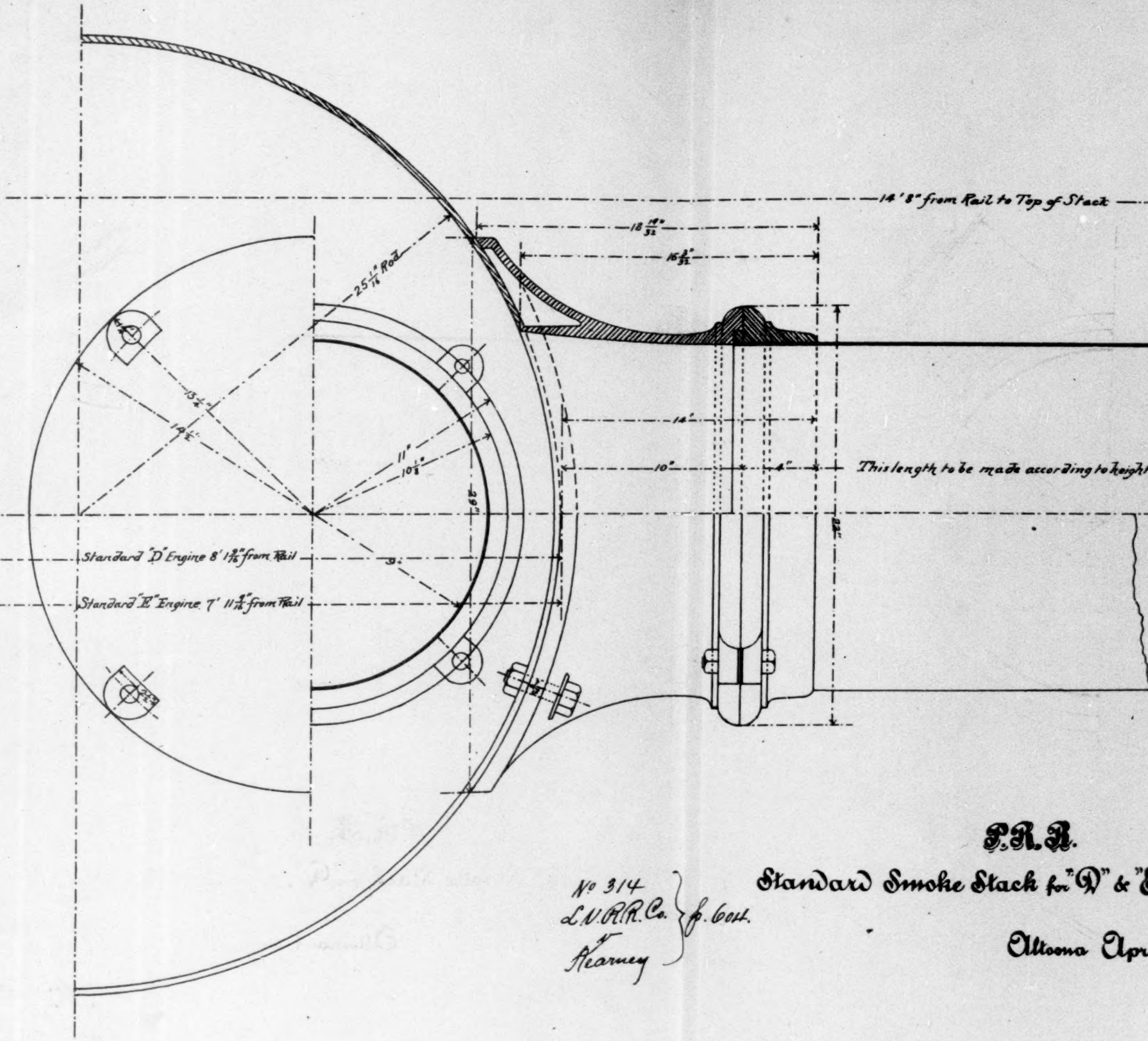
2

Kearney
vs
L. V. Rail Road Co

Defts. Exhibit
"Straight Stack"
S.D.O. Mr.
Feby. 18. 90



No 314
L V R R Co
v
Kearney
} p. 600


14' 8" from Rail to Top of Stack
18 19/32"
16 3/32"
25 1/16" Rod
13 1/4"
14 1/2"
11"
10 1/8"
29"
9
14"
10"
4"
22"
This length to be made according to height
Standard "D" Engine 8' 1 9/16" from Rail
Standard "E" Engine 7' 11 9/16" from Rail

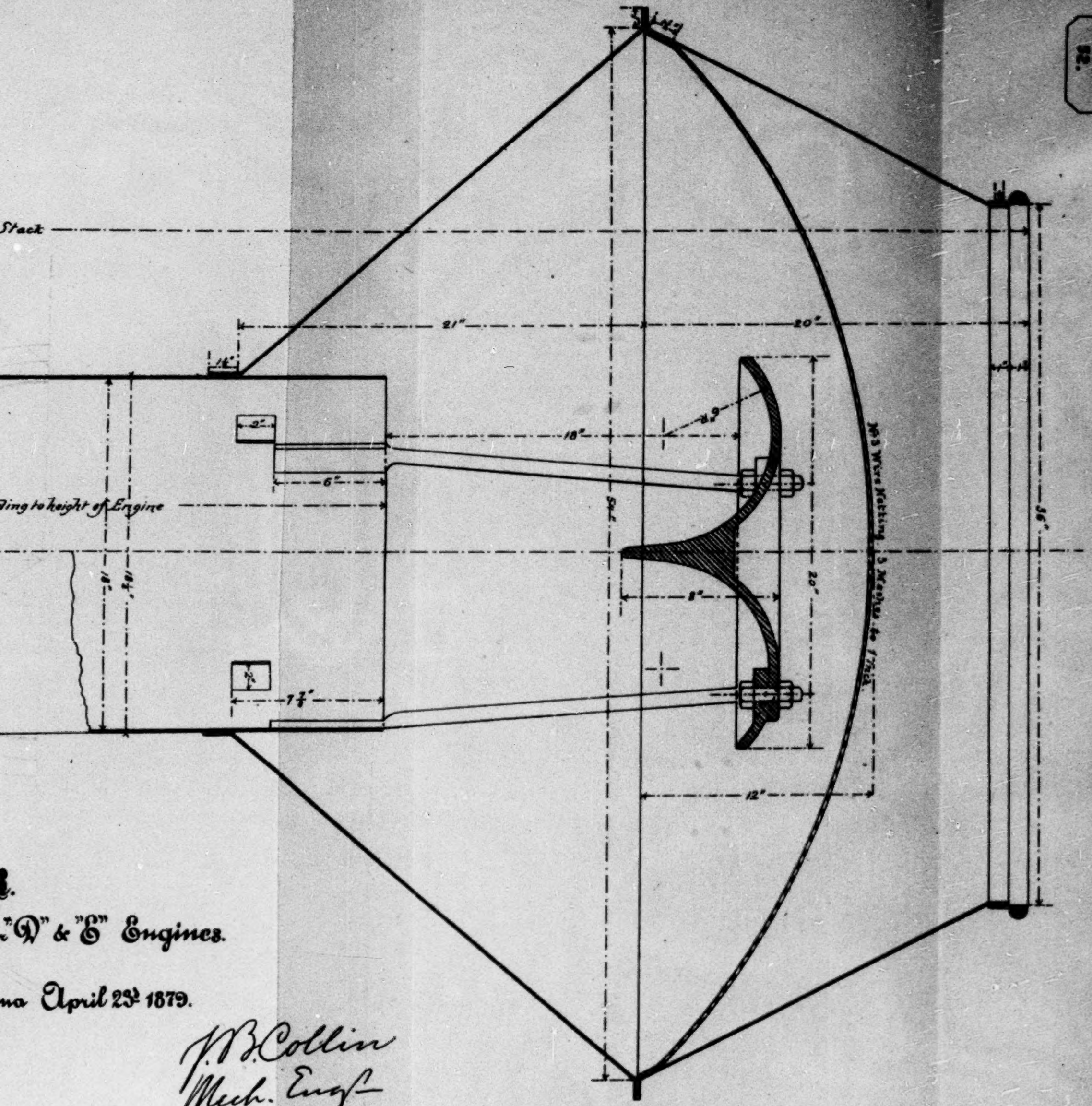
No 314
L.N.R.R. Co.
v
Kearney
} p. 604.

P.R.R.

Standard Smoke Stack for "D" & "E

Altoona Apr

52.



Stack
1½"
21"
20"
1½"
1"
1½"
2"
6"
18"
6"R
…ding to height of Engine
18"
18¼"
5 ft
8"
20"
36"
No 3 Wire Netting 3 Meshes to 1 Inch.
2"
7⅞"
12"

…"D" & "E" Engines.

…na April 23d 1879.

J. B. Collin
Mech. Engr

Itemized Cost of Vertical Cast-iron Screen for Stack.

Drilling lugs and bands, Ellsworth Case, 1 hour, 12	12	
Making 4 lugs, Christian Rausch, 2 " 20	40	
6 $\frac{1}{2}''$ bolts & 2 $\frac{3}{8}$ bolts, Wellington Case, 2 " 12	24	
5 lb $\frac{1}{8}''$ x 1″ iron for bands, 3	15	
$\frac{1}{2}$ " $\frac{1}{4}''$ iron rivets, 7½	04	
1 " " lugs, 3	03	
6 C. iron segments of screen, 54 lb, 3½	1 89	
		2 87
Difference in cost		2 62

Wire-netting screen put in during Aug-st, 1886, in use Jan'y 27, 1888, and in good condition.

1888, Oct. 5, last wire netting placed in smoke-head.

Page 53. Oct. 29th, '89.

[Endorsed:] U. S. circuit court, dist. of New Jersey. Kearney *et al. vs.* Lehigh Valley R. R. Co. Def't's Exhibit marked "Kinsey Statem't of Cost No. 1." S. D. O., m'r. Feb'y 18, '90.

(Here follow diagrams marked pp. 600 & 601.)

602 *Copy from Bill Book of Common No.* 10 *Iron Purchased During Period from* 1879 *to* 1884, *both Years Inclusive; also During the Year* 1889.

Date.	Page in bill book.	From whom purchased.	No. 10 common iron.	Price.
1879, Jan'y 18th	190	Justice Cox, Jr., & Co.	No. 10 common iron	$2\frac{6}{10}$
1881, " 29th	252	" " "	" " "	3
1881, June 20th	338	" " "	" " "	03
" Oct. 7th	406	" " "	" " "	$3\frac{1}{4}$
1883, Jan'y 17th	179	" " "	" " "	$3\frac{4}{10}$
1884, May 5th	486	" " "	" " "	$2\frac{3}{4}$
" July 12th	528	" " "	" " "	$2\frac{1}{2}$
" Oct. 18th	592	" " "	" " "	$2\frac{2}{10}$
1889, Jan. 3rd	186	" " "	" " "	$2\frac{15}{100}$

[Endorsed:] U. S. c't c't, dist of N. J. Kearney *et al. vs.* Lehigh Valley R. R. Co. Def't's Exhibit Cost of Iron. June 25, '90. S. D. O., ex'r. D'f't's Ex. Statem't Cost of Iron No. 10.

(Here follow diagrams marked pp. 603 & 604.)

605 [Endorsed:] 14,881. Sup. Court U. S., Octo. term, 1894. No. 314. The Lehigh Valley R. R. Co., app't, *vs.* Kearney & Tronson. Exhibits. Supreme Court U. S., clerk's office. Received, with record, Sep. 30, 1891.

Endorsed on cover: Case No. 14,881. New Jersey C. C. U. S. No. 314. The Lehigh Valley Railroad Company, appellant, *vs.* Francis Kearney and Mary F. Tronson. Filed October 8, 1891.

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Itemized Cost of Vertical Cast-iron Screen for Stack.

Drilling lugs and bands, Ellsworth Case, 1 hour, 12	12	
Making 4 lugs, Christian Rausch, 2 " 20	40	
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SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1894.

No. 314.

THE LEHIGH VALLEY RAILROAD COMPANY, Appellant,
and
FRANCIS KEARNEY *et al.*, Appellees.
On Appeal. Stipulation.

It appearing that in the record sent from the circuit court for the district of New Jersey in the above cause certain evidence of John I. Kinsey and John Clarke, taken at South Easton, Pennsylvania, the eighth day of February, eighteen hundred and eighty-eight, was inadvertently omitted, and that a certified copy thereof has been filed with the clerk of this court,

It is, on this fifteenth day of April, eighteen hundred and ninety-five, expressly stipulated that the said clerk file said omitted evidence and print the same immediately and annex to the printed record in said cause with the same effect as if said testimony had been included in the record and printed and served therewith.

ELWOOD C. HARRIS,
Solicitor of Appellees.
ROBERT J. FISHER,
Solicitor for Appellants.

United States Circuit Court, District of New Jersey.

FRANCIS KEARNEY and MARY F. TRONSON
vs.
THE LEHIGH VALLEY RAILROAD CO.

The taking of testimony in the above-stated cause on the part of the complainant on accounting was continued at the office of the Lehigh Valley Railroad Company, in South Easton, Pennsylvania, on Wednesday, the 8th day of February, A. D. 1888, before Hon. S. D. Oliphant, master.

Appearances as heretofore.

JOHN I. KINSEY (direct examination continued):

Q. I believe you stated yesterday that books similar to the one you then produced called "record of smoke-stack and spark-arrestor" is the only record you have that will show the condition of your stacks and arrestors at different times?

A. Yes, sir.

Q. Previous to introducing some wire screens in the smoke-stack, or in about the year 1877, the diamond-stack cone and netting at the top of the stack were universally in use as arrestors?

A. Yes, sir.

Q. Will you refer to one of the books covering the time of examining, from January 1st to April 1st, 1876, and state whether or not No. 3 stack, with cone and netting, was almost universally in use ?

A. It is almost universal, with the exception of one or two foreign engines that run here. I will explain that: The engines run from Wilkes Barre one day and ours ran up there one day.

Q. Will you run through this book for three months, from January 1st, 1876, to April 1st, 1876, and tell me how many times the screen and cone were found to be in a bad condition?

Objected to as immaterial, and counsel for defendant renews his former objection to the record showing spark-arrestor located in the smoke-stack of the locomotive, which the question calls for.

A. 32.

(By Mr. McCallum :)

Q. Some cones and some screens?

A. Yes, sir.

Further direct:

Q. In 1881 you were using pretty generally the stack No. 1 and mostly the screen with vertical openings?

A. Yes, sir.

Q. Will you examine the book covering that time and tell us how many times during the three months from Jan. 1st to April 1st, 1881, you found screens in bad condition?

A. 5.

Q. Also in 1880 you were pretty generally using the screens with vertical slots and in No. 1?

A. In 1880; yes, sir.

Q. Will you examine and state in how many instances from April 1st to July 1st, 1880, you found the screens used with No. 1 stack not in order?

A. Five.

Q. Two of those were on the same engines on days following each other, were they not?

A. Yes, sir.

Q. Would that indicate that it was the same one that was repaired?

A. I think it would.

Q. About how soon after 1886, when the Pennsylvania railroad required you to put in the wire screen spoken of yesterday, did you introduce them on all of your locomotives?

A. Commencing immediately. I can't tell you what length of time it took.

Q. Were they introduced or have they been introduced on all the locomotives on your division at the present time?

A. Yes, sir; I think every one has got it.

Q. Were these new screens that were put in, entirely?

A. Which—the wire netting?

Q. Yes, sir.

A. Yes, sir.

Q. Entirely new screens?

A. Yes, sir.

Q. Then it is not yet two years since you began to introduce them?

A. No, sir.

Q. Can you tell us over about what time the putting in of these screens extended after April 20, 1886?

A. No, sir.

Q. Down to nearly the present time?

A. We have had them in quite some time, but I could not tell you how long.

Q. Do you think it would be about correct to say they were put in during the course of a year after that time?

A. That I could not say positively.

Q. Would Mr. Clark, your boilerman, know better about that?

A. No; because we kept no record. We put them in just as fast as we could get them in, when we commenced to do it, and kept no record of the time.

Q. These screens, I suppose, sometimes needed repair, did they not?

A. Not unless they got broken by a collission, and if they got too ar gone we put a patch on them.

Q. These screens up to the present time are, then, comparatively new, are they not, in all the locomotives?

A. They are new from the time we commenced to put them in, in 1886.

Q. April 20th?

A. Yes, sir.

Q. They sometimes break, do they not? Here is a book. In 1877, Sept. 28th, there appears one broken, does there not?

A. I don't know how that occurred. Sometimes the men hit it——

A. I ask you whether the book shows that it was broken?

A. That shows that it was broken.

Q. October 29th there appears one broken on engine 423?

A. Yes, sir; that shows broken.

Q. December 13, appears one broken on engine No. 9, does there not?

A. Yes, sir.

Q. So that they were not entirely indestructible?

A. Have you ever seen anything that was? I don't know how that was broken; it might have been in a collission.

Q. If the collission had broken it, it would have so broken up the locomotive that that would not have probably been repaired the same day?

A. We can do such things.

Q. Have you in your books the cost of labor in 1879 as compared with the cost you gave us in the schedule yesterday?

A. Yes, sir.

Q. Can you produce it?

A. (Witness produced two books of wages.)

Q. Can you state generally how the price of labor, men of the same skill, compares now with 1879?

A. I should say that there was very little difference—comparatively little difference.

Q. Not enough to be of any real account?

A. No, sir; not in our pay-roll and the making of comparison, unless you go over the whole thing and foot it up.

Q. Have you on the books the amount paid for wire screens such as you now use?

A. I don't know about that; I don't do the purchasing. I send a requisition and it is purchased by our purchasing agent and I cannot tell about that positively. When we want anything special we telegraph to him and ask him the price. We got the price at 27 cents per foot when we made this screen.

Q. That is as you testified yesterday?

A. Yes, sir.

Q. How nearly can you give us the number of engines on which you placed the wire screen in the smoke-arch in changing your engines to a straight stack before you began using the vertical slot screen?

A. I can't tell positively, but I think we had in the neighborhood somewhere of 15 to 25. I am not positive about that, but somewhere in that neighborhood.

Q. Were those engines thus equipped used continuously with the wire screen to the present time or did they give way to the cast grating with vertical slots?

A. They gave way to the cast grating with vertical slots.

Q. Have you in the office a list of locomotive engineers operating your locomotives in the beginning of 1883?

A. Yes; we have all the names of the engineers.

Q. Do you know about how many there were?

A. No, sir.

Q. As many as one to each engine?

A. No, sir; there was not one to each engine; we have more engines than engineers at times.

Q. Where do the engineers on this division, most of them, reside?

A. All the way from one end of the road to the other. Some live at Amboy; some live between Amboy and Easton, some at Easton, some at Phillipsburgh, some at South Easton, and so on, scattered along the road.

Q. Can you give me from your records here a list of your locomotive engineers January 1st, 1883, and where they reside, and will you give me such list if I desire it?

A. It will take some time to do it. We haven't got time to do it now, because we have 150 names to keep. I can and will do so if desired.

Q. Did you put any of the vertical arrestors in locomotives coming in the shops from other divisions?

A. I have.

Q. Have you put any of the arrestors with vertical openings in the locomotives coming into your shops from other divisions of the road?

A. No, sir.

Q. Have you ever seen any locomotives from other divisions having arrestors with vertical slots?

A. I don't know whether I have or not.

Cross-examination (by Mr. McCallum):

Q. In examining the books produced today you find one engine that was reported, as you thought, twice as having a deficient spark-arrestor on two successive days, and thought from that that it might have been the same spark-arrestor twice reported. Does the same thing happen throughout the books in any of those you have examined today?

A. We had two sets of examiners; one looks at them at night after 6 o'clock, and the other the next day after six o'clock. That same engine might be lying in there and both men might examine it, and it might occur in that way.

Q. It might have occurred before in all these books?

A. Yes, sir; it has occurred before.

Q. In referring to the screen now in use, as reported in the current book, you find the word "broken" on three occasions. Would that indicate that the screen was worn out, or what?

A. No, sir; it would not indicate it being worn out?

Q. Can you say what it would indicate?

A. It would indicate that it might have been broken by accident.

Q. Do you know of any wire-gauze screen now in use having been repaired or having required repairing through becoming worn out?

A. Not to my knowledge.

John Clark, a witness being produced and sworn on the part of the complainant, testified as follows:

Direct examination (by Mr. Harris):

Q. Where do you reside and what is your employment?

A. I reside in South Easton, and am employed by the Lehigh Valley Company in the boiler shop—foreman.

Q. How long have you been foreman in the boiler-room?

A. I have been foreman and assistant foreman for 6 years.

Q. How long have you been in the boiler shop?

A. Since 1873.

Q. Are you familiar with the construction of stacks as shown you in Complainants' Exhibit "Boiler Stacks"?

A. Yes, sir.

Q. What is stack No. 1 called?
A. A straight stack.
Q. And what is stack No. 3 called?
A. Cone stack or diamond stack.
Q. Which stack is in use at the present time on the road?
A. No. 1 straight stack.
Q. When did the straight stack come generally into use?
A. I could not tell you exactly what date.
Q. Is the diamond stack used now at all?
A. No, sir.
Q. How was the straight stack constructed? I simply mean the inside part.

Defendant's counsel objects to all testimony regarding the construction of the stacks.

A. A casting on the top and at the bottom—that is, the straight stack inside and the outside casing.
Q. What was the inside pipe made of?
A. No. 10 iron.
Q. Cast or wrought?
A. Wrought.
Q. Sheet iron?
A. Sheet iron.
Q. And it was bound around in a circle?
A. In a circle of 16 inches and riveted.
Q. 16 inches in diameter?
A. Yes, sir.
Q. Will you explain how the diamond stack was constructed?
A. It was constructed in four sections—a section from A to B, from B to C, from C to D, and from D to E.
Q. How were the sections joined at the point- B, C, & D?
A. They were riveted at B and bolted at C; riveted at D.
Q. The making of the diamond stack requires a great deal more time than a straight stack?
A. I could not say. It has been quite awhile since we made a diamond stack, and I could not say the time of it.
Q. In the straight stack in number 1 there was simply a row of rivets up one side?
A. Yes, sir.
Q. About how long is that stack from there up to that?
A. About five feet ten inches.
Q. In the other stack, the diamond stack, the sections were riveted up and down?.
A. Yes, sir.
Q. Also riveted in three circles, were they not?
A. Yes, sir.
Q. Was the straight part of the diamond stack about the same size as the straight stack?
A. Yes, sir.
Q. How much larger in diameter at the point C?
A. As near as I can remember, it was forty inches.

Q. That would be about 2½ times, would it not?

A. Yes, sir.

Q. Do you know about how many bolts it took to fasten it together at point C?

A. No, sir; I don't recollect.

Q. About how far apart were the bolts?

A. That I don't remember.

Q. 1 inch or 6 inches?

A. I think it was nearer 6 than 1.

Q. More than 6?

A. That I could not say.

Q. You are a practical boiler-maker, are you not?

A. Yes, sir.

Q. Would you or not say that there was twice as much work in making a diamond stack as in making a straight stack, simply the inside?

A. I could not say, simply because there is a casting goes on the upper end of the straight stack; it goes through other hands before it reaches us in the boiler shop.

Q. Without regard to the casting at the top, I am now simply speaking of the pipe through which the smoke, &c., passes; not the outside, simply the pipe.

A. We have got to have the outside ornamentation to form the stack by.

Q. Would a straight pipe without the ornamentation or casing outside conduct the smoke out as well as the other?

A. Yes, sir; but it requires the casing to bolt it fast to the locomotive at the lower end.

Q. How about the diamond stack?

A. It requires the same thing.

Q. So far as the castings are concerned, to attach it to the locomotive, it is the same thing in both stacks?

A. Yes, sir.

Q. Is there any more or less iron in the diamond stack than the straight stack? I simply mean the inside.

A. There is more wrought iron in the diamond stack, but there is more cast iron in weight in the straight stack.

Q. That is by reason of having something around the top of the stack in the straight stack?

A. Yes, sir.

Q. Is the height of the diamond stack above the top of the boiler about the same as the straight stack?

A. Yes, sir; about the same.

Q. How many pieces of iron were there in each of the flared sections B, C, & *C* D—only the one piece?

A. I don't recollect.

Q. Then as a boiler-maker you cannot give us any opinion as to the relative amount of work in making these two stacks?

A. I can give you the amount of work, as I said before, but it is on the wrought iron.

Q. I am only speaking of the wrought iron on the inside?

A. Certainly there is more work—that is, in the sheet-iron work—on the diamond stack than there is on the straight stack.

Q. How long would it take two men to bend and rivet a straight stack—just the sheet-iron part?

A. I never took any account of it. They can mostly tell you in the office here, Mr. Kinsey.

Q. You as foreman ought to know how long you would expect a man to work on it. You would not expect a man to work a week on that?

A. No, sir.

Q. About how long?

A. You want to take the inside pipe?

Q. You take a flat piece of iron 16 inches in diameter; therefore you take a flat piece of iron 5 feet one way and something over 4 feet the other; that is to be bent in a curve, and then there is a row of rivets where the parts join. How long would it take two men to bend and rivet it?

A. It would take two men about 6 hours, I should judge.

Q. How long do you think it would take 2 men to bend and rivet the two straight sections on No. 3 up to there—that little one at the top?

A. That I don't remember.

Q. About as long, evidently?

A. No, sir; it would take longer.

Q. How much longer?

A. That I could not say. Those cone pieces had to be laid out separately. We never kept any account.

Q. Was it a great deal of work to lay out the two cone pieces and to shape them so as to join them on the straight pieces?

A. It takes longer to lay out a cone piece than it does to lay out a straight piece.

Q. Then there is the riveting around two circumferences at B & D and making the holes—boring—and there is also the bolting and making a hole around the large circumference at C, is there not?

A. Yes, sir.

Q. From the very shape of those cone pieces, they don't use up near all the flat-metal plate?

A. No, sir; if they trim off.

Q. If it takes two men, as you have estimated, in bending and riveting the inside of the straight stack in No. 1, 6 hours, about how long would it take the same two men to shape, bend, rivet, and bolt the diamond stack in No. 3?

A. That I can't remember, because it has been a good while ago, and we never took account of the cone stack.

Q. There would be as many holes to bore and rivets to put in around each circumference, at B & D, as there would be in the whole height of the stack No. 1?

A. It all depends upon how far they are apart.

Q. If the same distance apart, that would be true, would it not?

A. Yes, sir.

Q. And of bolts and holes to join the circumference at C there would be, if the same distance apart, twice as many, would there not?

A. Yes, sir; it would take almost three times as many.

Q. The object of the cone placed in stack No. 3 was to break the force of the coal before they struck the netting on each side, was it not?

A. Yes, sir.

Q. Does that force, in order to resist it, require really a stronger stack in the diamond shape than in a straight stack, where there is no resistance to the coal going out?

A. Both stacks were of the same thickness.

Q. When you used the diamond stack did the stack frequently require repairs about the diamond part of it?

A. That I don't remember.

Q. After April, 1886—that is, two years ago this coming April—you began to put wire screens in the smoke-arch in the place of castings, didn't you?

A. Yes, sir.

Q. Were those or have those wire screen- been introduced at the present time on all the locomotives that came to your shops?

A. Have they been introduced now?

Q. Have they been introduced up to the present time?

A. Yes, sir. We are putting them in as fast as they come in.

Q. Are there some locomotives yet using cast screens?

A. There is only one as I can remember that is here.

Q. Then from that date for a year or more were you introducing wire netting in place of the castings, gradually?

A. Every chance we got.

Q. About what time did it take to introduce them upon most of the engines after April, 1886?

A. That I don't remember.

Q. Did you introduce many during the year 1887—last year?

A. That I don't remember.

Counsel for defendant renews the objection to all the testimony given by this witness respecting the construction and relative cost of the smoke-stack as immaterial, and gives notice that he will move to strike out the same at the hearing of the case.

Not cross-examined.

Adjourned until further notice.

UNITED STATES OF AMERICA, } *ss:*
District of New Jersey, }

I, S. D. Oliphant, clerk of the circuit court of the United States of America for the district of New Jersey, in the third circuit, do hereby certify the foregoing to be a true copy of the original testimony on part of complainant- on file and now remaining among the records of the said court in my office.

The Seal of the U. S. Circuit Court, Dist. of New Jersey.

In testimony whereof I have hereunto subscribed my name and affixed the seal of the said court, at Trenton, in said district, this eleventh day of April, in the year of our Lord one thousand eight hundred and ninety-five, and of the Independence of the United States the one hundred and nineteenth.

S. D. OLIPHANT,
Clerk Circuit Court U. S.

[Endorsed:] United States circuit court, district of New Jersey. Francis Kearney and Mary F. Tronson *vs.* The Lehigh Valley Railroad Co. Testimony on part of complainant-.

[Endorsed:] Case No. 14,881. Supreme Court U. S., October term, 1894. Term No., 314. The Lehigh Valley Railroad Co., app't, *vs.* Francis Kearney *et al.* Stipulation and addition to record. Filed Ap'l 16, 1895.

158

158-461

[illegible]
JAMES H. MCKE

Supreme Court of the United States.

No. 314.

THE
LEHIGH VALLEY RAILROAD COMPANY,
Appellant,
v.
FRANCIS KEARNEY and
ELWOOD C. HARRIS, Administrator of Mary F. Tronson, Deceased,
Appellees.

Brief of Argument for Appellant.

CHARLES E. MITCHELL,
ROBERT J. FISHER,
For Appellant.

WASHINGTON, D. C.:
Gibson Bros., Printers and Bookbinders.
1895.

IN THE

Supreme Court of the United States.

OCTOBER TERM, 1894.

THE LEHIGH VALLEY RAILROAD COMPANY, Appellant, *v.* FRANCIS KEARNEY AND ELWOOD C. HARRIS, Administrator of Mary F. Tronson, Deceased, Appellees.	*No.* 314.

Brief for Appellant.

STATEMENT OF THE CASE.

This is a suit in equity brought, in the circuit court of the United States for the district of New Jersey, by Francis Kearney and Mary F. Tronson, executrix of Luke F. Tronson, deceased, against The Lehigh Valley Railroad Company, the appellant, for the alleged infringement of reissued letters patent of the United States, No. 5184, granted to Francis Kearney and Luke F. Tronson, December 10, 1872, for an improvement in spark-arresters, the original patent having been granted April 11, 1871, No. 113,528. Mary F. Tronson, one of the appellees, having died since the appeal was taken, the cause, by leave of court, is proceeding in the name of her administrator, Elwood C. Harris.

THE BILL—

(1) Avers that Francis Kearney and Luke F. Tronson were the original, first, and joint inventors of certain new and useful improvements in spark-arresters for locomotives.

(2) That, due application having been made, they obtained therefor letters patent of the United States, No. 113,528.

(3) That for good and lawful cause they surrendered said letters patent, and, due application having been made therefor, they obtained new letters patent, No. 5184, for the same invention.

(4) That, after the grant of said letters patent, the said Luke F. Tronson died testate, and that his widow, Mary F. Tronson, was duly authorized, as executrix, to administer upon his estate.

(5) That the title to said patent is vested in said complainants.

(6) Avers infringement by the appellants by making and using said invention.

(7) Prays for an injunction and account.

THE ANSWER—

(1) Admits the application for the grant of letters patent.

(2) Avers want of knowledge of the grant and issue of letters patent No. 113,528.

(3) Admits the surrender and reissue of said letters patent No. 113,528, and the grant of reissued letters patent No. 5184, but denies that said letters patent were surrendered and reissued for lawful cause.

(4) Avers that said letters patent No. 113,528 were not inoperative or void by reason of a defective specification or for any other lawful reason; that the reissue is not for the same invention described and claimed in the original; that new matter has been introduced into the specification of said reissued patent; that by the said reissue the scope of

said original has been enlarged and extended so as to cover a different invention from that described and claimed in the original; that said reissue was not applied for within a reasonable time after the date of said original, and that said reissue is therefore invalid.

(5) Avers want of knowledge as to the death of Luke F. Tronson and the due appointment of Mary F. Tronson as his executrix.

(6) Denies that the said alleged improvement covered by said letters patent is of any practical utility or value.

(7) Denies that the said Francis Kearney and Luke F. Tronson were the true, original, first, and joint inventors of the invention described and claimed in said reissued patent No. 5184.

(8) Avers that the invention claimed in said letters patent was, long before the alleged invention or discovery by said Kearney and Tronson, described in the following letters patent of the United States:

No. 2143, granted to Leonard Phleger, June 26, 1841.

No. 17,884, granted to Ethelred May, July 28, 1857.

No. 33,014, granted to James L. Vauclain, August 20, 1861.

No. 38,992, granted to Allen S. Sweet, jr., June 23, 1863.

No. 106,515, granted to James Smith, August 16, 1870.

No. 110,315, granted to Weidman, Major and Sample, December 20, 1870.

No. 112,506, granted to James Smith, March 7, 1871.

(9) Denies infringement.

A replication was filed by appellees and testimony taken on both sides.

The Defence.

The appellant relied upon the following matters of defence:

First. That the reissue is illegal and void because the original patent was not inoperative or invalid by reason of a defective or insufficient specification or any error arising from inadvertence, accident, or mistake; that the scope of the patent has been enlarged so as to cover another and different invention from the original, and that new matter has been introduced into the specification.

Second. That the alleged invention covered by the reissued patent is not patentable, since the change from prior forms of spark-arrester was not productive of any improved or materially different result.

Third. That the reissued patent is void for lack of substantial novelty in the subject-matter thereof in view of the prior state of the art as shown in the following patents:

No. 2143, granted to Leonard Phleger, June 26, 1841.

No. 17,884, granted to Ethelred May, July 28, 1857.

No. 33,014, granted to James L. Vauclain, August 20, 1861.

No. 38,992, granted to Allen S. Sweet, Jr., June 23, 1863.

No. 106,515, granted to James Smith, August 16, 1870.

No. 110,315, granted to Weidman, Major and Sample, December 20, 1870.

No. 112,506, granted to James Smith, March 7, 1871.

Fourth. Non-infringement, as the device used by the defendant is substantially and materially different from that covered by the claims of the Kearney and Tronson patent.

Opinion of the Court.

The case was heard, on bill, answer, and proofs, by Mr. Justice Bradley, who decided it in favor of the appellees, finding that the reissued patent embraces substantially the same invention as the original; that the reissue was properly granted; that the drawings of the reissue are the same as those of the original; that the specification does not contain such new matter as to render the reissue void, and that the application for the reissue was filed within a reasonable time after the grant of the original.

The court also found that when limited to the terms of the claim there was nothing in the prior state of the art to invalidate the patent. The court further found that the form of spark-arrester covered by the patent is applicable to any form of pipe for discharging the exhaust steam and products of combustion from the smoke-box of a locomotive, and that the structure used by the defendant is substantially the same as that covered by the first claim of the Kearney and Tronson patent, and that such claim is therefore infringed (Record, pages 142 to 146).

THE ACCOUNTING.

Having thus disposed of the grounds of defence as before stated, the usual decree was entered referring the case to a master to take an account of the gains and profits accruing to defendants by reason of their infringement and of the damages suffered by the complainants thereby. Testimony was taken before the master, and a report filed by him (Record, page 270), in which he finds that no damages have been sustained, but that the Lehigh Valley Railroad Company was enabled by the use of the cast-iron screens in the smoke-box, in place of screens of wire netting which they had previously used in the same place, to effect a saving of two dollars and sixty-two cents per screen, amounting in the aggregate, upon one hundred and eighty sets of screens which they had made, to four hundred and seventy-one dollars and sixty cents. This award of the master was made upon his construction of the opinion of the court that the invention had relation to the form and construction of the spark-arresting grate, and to that only. The complainants below, however, contended that comparison should be made, not between the cost of the cast-iron grating and the grating of wire netting (both located at the base of a spark or other pipe), but between the straight smoke-stack provided with the grating in the smoke-box on the one hand and the so-called diamond stack provided with a spark-arrester of netting at its upper end on the other hand. They therefore filed exceptions to the master's report, as follows:

> "*First.* Because the said master fixed the amount of gains and profits realized by the defendant at two dollars and sixty-two cents per screen as the difference in cost of the 'rim-net stack screens, previously used' by the defendants and the infringing device, basing said amount on Mr. Kinsey's statement of cost, when, as a matter of fact, said statement was not the cost of the rim-net stack screen, but of a wire screen placed in the smoke-arch, which the defendants could not use except by adding a spark-box costing from ninety to one hundred dollars per locomotive.
>
> "*Second.* Because the said master construed the words 'the invention has relation to the form and construction of the spark-arresting grate, and to that only, and as applicable to one kind of pipe as another,' contained in the opinion of Mr. Justice Bradley in this cause, as excluding the consideration of the diamond stack in determining the defendants' gains and profits, when, in fact, said language referred to the petticoat or other pipe to which the infringing device was attached, and not to the stack at all.
>
> "*Third.* Because the said master refused to allow to the complainants the gains and profits realized by the defendants in using the infringing device as a spark-arrester, instead of the diamond stack, cone, and netting as the spark-arrester in common use by the defendants until the adoption of the infringing device, and by other railroads previous to and during the time of use by the defendants of the infringing device, which profits consist of difference in cost of construction between the diamond stack and straight smoke-stacks used in connection with the infringing device, a saving of renewals of diamond stacks, a saving in netting every three months, and a saving in the time and labor of mechanics, amounting in three years (the average time the defendants used the infringing device on one hundred and twenty-eight locomotives) to about eighty-three dollars per locomotive, or a total of more than ten thousand six hundred dollars, and which amount said master should have allowed to complainants." (P. 172.)

Argument having been had upon these exceptions, the court sustained them to the extent that the gains and profits should be computed by a comparison between the cost of the diamond stack and the cost of repairing it and the iron grate netting with the straight stack, and thereupon made an order referring the case back to the master with—

> "Instructions to allow the complainants, by way of profits realized by the defendants, the difference between the cost and expense of the diamond stack arresters and incident to the use thereof as compared with the cost and expense of the iron bar grate arresters used by the defendants in violation of the patent sued on, and the incidents to their use." (P. 272–273.)

Further testimony was thereupon taken before the master, who reported that upon this basis the gains and profits amounted to four thousand six hundred and twenty-eight dollars and seventy-two cents.

To this report of the master both parties filed exceptions (p. 301–302).

These exceptions having been considered by the court, and the master's findings not having been approved in all respects, the court proceeded to state the account, taking as a basis of such account what was deemed to be the gains made by the use of a straight smoke-stack in connection with the grating held to infringe over the use of the diamond stack. The full amount of profits held to be realized was six thousand two hundred and thirty-five dollars and fifty-two cents, and this sum the defendant below was decreed to pay (p. 303 to 306.)

ASSIGNMENT OF ERRORS.

From the final decree in this cause the appellants appeal to this court, submitting that the court below erred, in view of the evidence, in finding:

First. That the reissued patent is for the same invention as the original.

Second. That there was any ambiguity in the original patent which needed correction by surrender and reissue.

Third. That "the paragraphs which explained the difficulties and defects of prior spark-arresters, and how the patentees have avoided them by their invention, cannot be regarded as that sort of new matter which renders a reissue void."

Fourth. That the invention covered by such patent is not anticipated by the patents to Hubbell, May, Vauclain, Sweet, Smith, and Weidman, Major and Sample.

Fifth. That the first claim of the patent covers any structure coming within its description and placed in the smoke-head of a locomotive boiler, regardless of the form or dimensions of the pipe to which it is applied.

Sixth. That defendant's structure is substantially the same as that covered by the first claim of the patent, and that such patent is therefore infringed.

Seventh. Even assuming that complainants were entitled to recover, the court erred in setting aside the original report of the master, but should have confirmed the same.

Eighth. The court erred in directing the master "to allow to the complainants in the accounting, by way of profits realized by the defendant in using the invention of the complainants, the difference between the cost and expense of construction and using the diamond stack spark-arresters, including the cost and expense incident to such use, and the cost and expense of constructing and using the iron-bar grate spark-arresters decreed to be an infringement of the patent sued on, for the time and to the extent which they did use the same, including the cost and expense incident to such use."

Ninth. The court erred in taking as a basis for computing the defendant's gains and profits a comparison between the cost of making and using the diamond stack and the cost of the straight stack used by the defendant with the grating held to infringe.

Tenth. The court erred in allowing to the complainants, as gains and profits realized by the defendant in the use of the alleged infringing device, the sum of $6,255.52.

Eleventh. The court erred in not sustaining the exceptions of defendant's counsel to the reports of the master.

Twelfth. The court erred in sustaining the complainants' exceptions to the reports of the master.

APPELLANT'S POINTS.

I.

The Kearney and Tronson reissued patent is invalid because the device covered by the claims thereof is not productive of any new or improved result and is not patentably different from other spark-arresters which had long preceded it in the art.

Patent to Hubbell (p. 108).
Patent to May (p. 111).
Patent to Vauclain (p. 113).
Patent to Weidman, Major and Sample (p. 115).
Patent to Sweet (p. 118).
Patents to Smith (pp. 122–125).
Brevoort (pp. 76, 77, 78, 79, 81, 82, 83).
Kearney (pp. 45–46).
Reasoner (p. 89).
Lewis (pp. 89, 90, 91).
Kinsey (pp. 63, 64, 65, 171, 172).
Musick (pp. 69, 70, 71).
Bachman (p. 62).
Mitchell (pp. 59–60).
Defendant's Exhibit B (p. 586).
" " C (p. 587).
" " D (p. 588).
" " E (p. 93).
" " F (p. 99).
Defendant's Exhibit Mitchell's Improved Spark-Arrester (p. 589).

II.

The reissued patent is invalid because of the insertion of new matter into the specification which enlarges the scope of the original patent and makes it cover, if valid, a broader and different invention.

Defendant's Exhibit E (p. 93).
" " F (p. 99).
Russell *v.* Dodge, 93 U. S. 460.
Powder Co. *v.* Powder Works, 98 U. S. 126.
Swain Manfg. Co. *v.* Ladd, 102 U. S. 408.
Heald *v.* Rice, 104 U. S. 737.
Coon *v.* Wilson, 113 U. S. 268.
Ives *v.* Sargent, 119 U. S. 652.
Parker & Whipple Co. *v.* Yale Co., 123 U. S. 87.
Freeman *v.* Asmus, 145 U. S. 226.

III.

The reissued patent is invalid because the original patent was not inoperative or invalid by reason of a defective or insufficient specification or any error in the original arising from inadvertence, accident, or mistake.

Brevoort (pp. 73, 74, 75).
Kearney (pp. 47, 48, 50).
Defendant's Exhibit E (p. 93).
" " F (p. 99).
Leggett *v.* Avery, 101 U. S. 256.
Ball *v.* Langles, 102 U. S. 128.
Goodyear Co. *v.* Davis, 102 U. S. 222.
Miller *v.* Brass Co., 104 U. S. 350.
James *v.* Campbell, 104 U. S. 356.
Mahn *v.* Harwood, 112 U. S. 354.
Cartridge Co. *v.* Cartridge Co., 112 U. S. 624.
Shepard *v.* Carrigan, 116 U. S. 593.
Gardner *v.* Hertz, 118 U. S. 180.
Crawford *v.* Heysenger, 123 U. S. 589.
Matthews *v.* Iron Clad Mfg. Co., 124 U. S. 347.
Yale Lock Mfg. Co. *v.* Berkshire Natl. Bank, 135 U. S. 342.

Dobson *v.* Lees, 137 U. S. 258.
Electric Gas-Lighting Co. *v.* Boston Electric Co., 139 U. S. 481.
Topliff *v.* Topliff, 145 U. S. 156.
Corbin Cabinet Lock Co. *v.* Eagle Lock Co., 150 U. S. 38.
Dunham *v.* Dennison Mfg. Co., 154 U. S. 103.

IV.

The first claim of the reissued patent, if valid, must be limited to the combination of a grating such as is shown and described in the drawings and specifications, namely, a series of long bars placed vertically with correspondingly long openings between them extending from the top to the bottom of the grating, and a petticoat pipe of the form shown in the drawings and open into the smoke-box at both top and bottom.

Patent to Hubbell (p. 108).
Patent to May (p. 111).
Patent to Vauclain (p. 113).
Smith, 1871 (p. 125).
Brevoort (pp. 74, 76, 81).
Lewis (p. 90).
Kinsey (pp. 65, 66).
Kearney (p. 48).
Defendant's Exhibit E (p. 93).
" " F (p. 99).
Hailes *v.* Van Wormer, 20 Wall. 353.
Wicke *v.* Ortrum, 13 Otto, 461.
Keystone Bridge Co. *v.* Phœnix Iron Co., 95 U. S. 279.
Wier *v.* Morden, 125 U. S. 98.
Hendy *v.* Golden State, 127 U. S. 370.
Knapp *v.* Morss, 150 U. S. 221.
Wollensak *v.* Sargent, 151 U. S. 221.
McCormick *v.* Aultman, 58 Fed. Rep. 773.

V.

The appellant's spark-arrester does not infringe the first claim of the Kearney and Tronson reissued patent, since it is materially different therefrom in construction and operation.

Lewis (p. 90).
Kinsey (pp. 65, 66).
Quinn (p. 38).
Breisch (pp. 40, 41).
Kearney (pp. 48, 49).
Drake (p. 52).
Brevoort (pp. 79, 80, 81).
Defendant's Exhibit A (p. 85).
Water Meter Co. *v.* Desper, 11 Otto, 332.
Eames *v.* Godfrey, 1 Wall. 78.

VI.

In determining the gains and profits made by the appellant from the use of the alleged infringing device, comparison should be made between the cost of such device as placed in the smoke-box of a locomotive and other similar devices, also placed in the smoke-box, which were open to the appellant to use, and some of which it had used.

Patents to Hubbell, May, Vauclain, and Smith.
Goodwin (p. 350).
Kinsey (pp. 67, 161, 260).
Mitchell (pp. 61, 254).
Van Horn (p. 175).
Hall (p. 181).
Hoficker (p. 250).
Henszey (pp. 237, 238, 239, 248, 249).
Campbell (p. 252).
Strattan (p. 290).

Kearney (p. 226).
Complainants' Exhibit Boiler Stacks (p. 307).
Defendant's Exhibit Straight Stack (p. 311).
Defendant's Exhibit Mitchell, No. 1 (p. 594).
Exhibit Mitchell's Improved Spark-Arrester (p. 589).
Exhibit Mitchell's Spark-Arrester, Drawing No. 3 (p. 590).
Defendant's Exhibit, Campbell (p. 592).
Blue-print drawings, offered by defendant, referred to in Strattan's affidavit (p. 603).
Defendant's Exhibit Blue-Print Spark-Arrester (p. 591).
Robinson on Patents, sec. 1145.
Mowry *v.* Whitney, 11 Wall. 620.
Littlefield *v.* Perry, 21 Wall. 205.
Goulds Mfg. Co. *v.* Cowing, 105 U. S. 253.
Black *v.* Thorn, 111 U. S. 122.
Tilghman *v.* Proctor, 125 U. S. 136.
McCreary *v.* Penna. Canal Co., 141 U. S. 459.

VII.

In determining gains and profits, comparison should not have been made, as was done by the court below, between the cost of the diamond stack and of the straight stack used with the alleged infringing device.

Same authorities as point VI.

ARGUMENT.

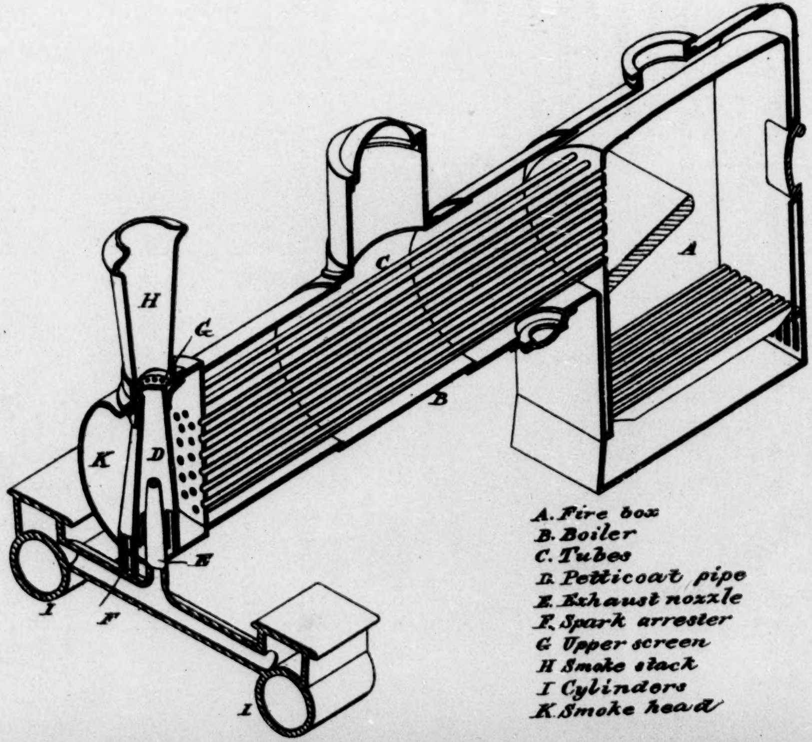
State of the Art.

As a means of heating the water in the boilers of locomotive engines as ordinarily constructed, a series of tubes, passing through the boiler, leads from the furnace or fire-box to the forward end of the locomotive, into a chamber called the smoke-box. The products of combustion, consisting of smoke, gases, and cinders, are carried from the fire through these tubes into the smoke-box, from which they are discharged into the atmosphere through the smoke-stack.

In order to create a draft in the fire-box the steam after having acted upon the pistons is exhausted from the cylinders into the smoke-box, and passes out through the smoke-stack with the products of combustion. This exhaust steam, being discharged into the smoke-box with some force, necessarily creates a strong draft, which carries sparks and cinders, and sometimes large pieces of ignited fuel, into the smoke-box, and it therefore becomes necessary to provide some means of preventing or arresting their discharge through the smoke-stack so that fires may not be caused alongside the railroad tracks. This necessity has given rise to a class of mechanical devices called spark-arresters, with which all locomotives are provided, and with which they were provided long prior to any date which can be assigned to the Kearney and Tronson patent upon which this suit is based.

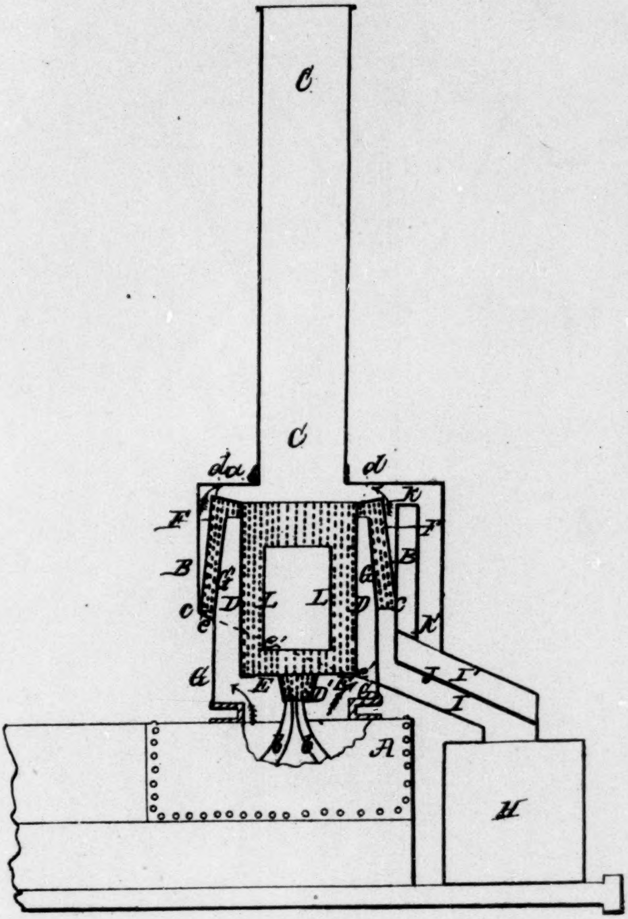
The patent to Hubbell, found upon page 108 of the record, shows such a device as far back as 1841, consisting of a cylinder of wire gauze or perforated metal placed in the smoke-box, below the base of the smoke-stack.

In order to direct the exhaust steam into the smoke-stack and render the draft perfect, it has long been the custom to use within the smoke-box a pipe into which the exhaust steam is discharged through contracted openings called exhaust nozzles. This pipe has generally taken one of two forms. In the first the pipe tapers from top to bottom, being greater in diameter at the bottom. Its top diameter being less also than the base of the smoke-stack, an opening is left between the top of such pipe and the opening for the stack leading out of the top of the smoke-box. To this opening it is therefore necessary to apply a screen to arrest dangerous sparks. This form of pipe is shown in the Kearney and Tronson patent, is marked E in the drawings, and is technically known as a petticoat pipe. The other form



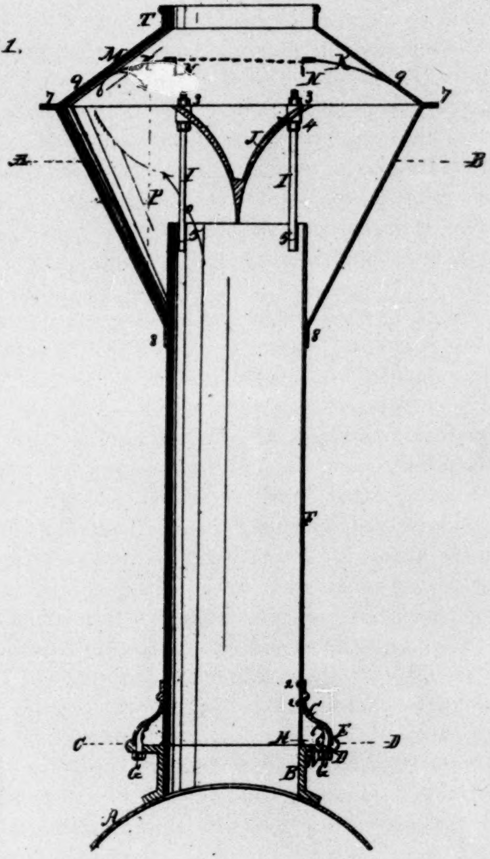
A. Fire box
B. Boiler
C. Tubes
D. Petticoat pipe
E. Exhaust nozzle
F. Spark arrester
G. Upper screen
H. Smoke stack
I. Cylinders
K. Smoke head

Fig: 1



THE HUBBELL PATENT.

Fig: 1.



THE DIAMOND STACK.

THE KEARNEY AND TRONSON PATENT.

The general state of the art prior to the Kearney and Tronson patent having been indicated, the construction covered by such patent may now be considered.

Taking first the original patent, the exhaust steam pipes, marked I in the drawings, pass into the base of the petticoat pipe through a cage or grating consisting, as the specification states, of "perpendicular bars with fixed apertures sufficiently fine to stop the sparks that come from the fire."

Upon the top of this grating is fitted a pipe which, as has been seen, is the ordinary petticoat pipe. Between the space at the top of this pipe and the bottom of the smoke-stack is a netting, marked F in the drawing, which appears to be made from a sheet of perforated metal. The specification calls it a netting or grating.

The patent has but a single claim, as follows:

> "The grate D with longitudinal bars, as and for the purposes specified and shown."

The application for this patent was filed January 5, 1871.

Long prior to that date it was customary to place spark-arresters below the base of the smoke-stack, and at the bottom of the pipe into which the exhaust nozzles discharge.

The patent to Hubbell, before referred to, is an excellent example of this construction, the petticoat pipe being designated by the letters L L in the drawing.

In the patent to May, granted July 28, 1857 (Record, page 111), is shown a similar structure in which the spark-arrester consists of a cage of wire gauze or perforated plates of metal placed at the bottom of a downward extension of the smoke-stack, and in which the exhaust nozzles enter the lower end of the cage.

In Vauclain, granted August 20, 1861 (Record, page 113), is shown a similar cage or grating consisting of a perforated cylindrical box or screen, with practically the same arrange-

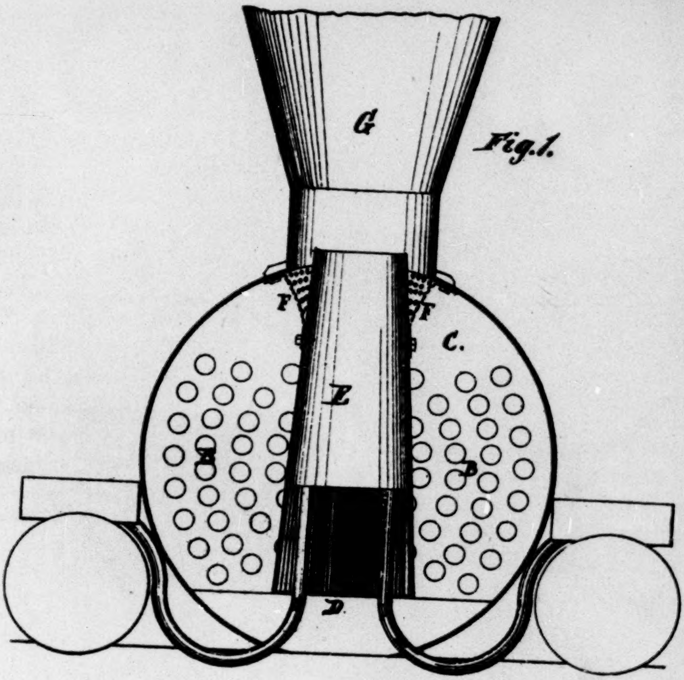
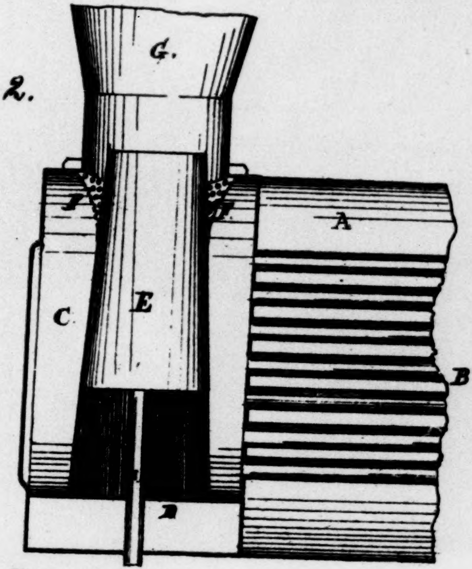


Fig.1.

Fig. 2.



THE KEARNEY AND TRONSON ORIGINAL.

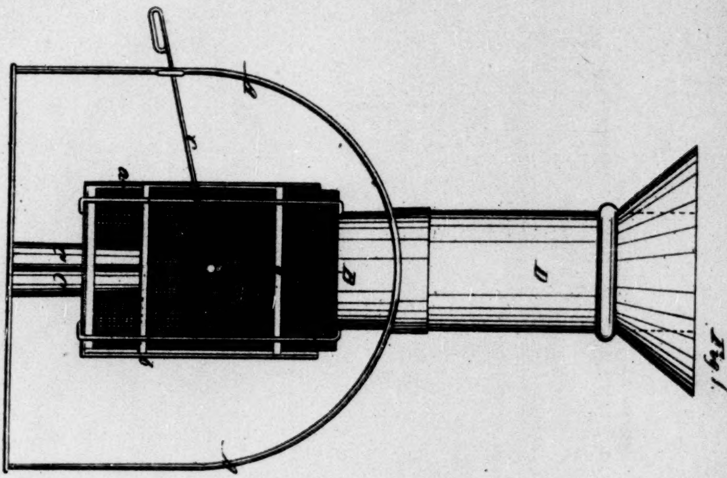


Fig. 1

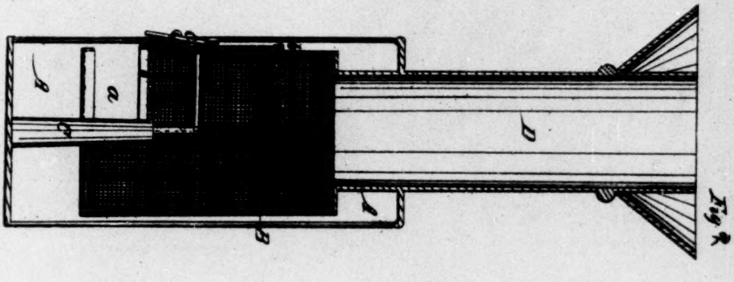


Fig. 2

THE MAY PATENT.

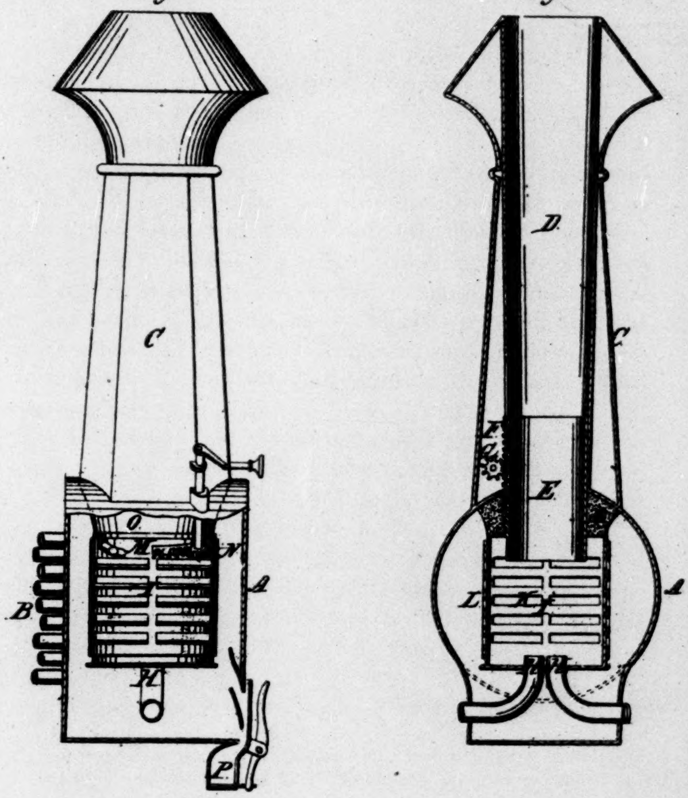


Fig. 1 Fig. 2.

THE VAUCLAIN PATENT.

ment of downward extension of stack and exhaust nozzles, except that there is an opening, also screened, at the top of the cage, for the passage of smoke and gases, and in which the perforations in the cage for the passage of smoke and gases are horizontal. These perforations are quite elongated and are called latitudinal slots.

In Weidman, Major and Sample, granted December 20, 1870 (Record, page 115), a similar device made of perforated metal is shown.

In Sweet, granted June 23, 1863 (Record, page 118), is shown a similar device composed of wire gauze.

In Smith, granted August 16, 1870 (Record, page 122), perforated metal is used.

All these patents bear dates earlier than Kearney and Tronson's invention, and show that prior thereto spark-arresters had long and commonly been placed at the base of the smoke-stack in connection with a petticoat or spark pipe, or a downward extension of the smoke-stack; that the exhaust nozzles had been led into the base of such arresters; and that such arresters had been made from wire gauze and from perforated metal, the perforations producing in at least one instance horizontal gratings.

It is also shown that the advantages of placing the spark-arrester in the smoke-box instead of in the smoke-stack were fully recognized as early as 1857, as appears from the sixth paragraph of the specification of the May patent.

This being the state of the art when Kearney and Tronson made application for their patent, the file-wrapper and contents of their application which are in evidence, Defendant's Exhibit E (Record, page 93), are of value in ascertaining the scope of the original patent.

In the specification as originally filed it is stated that—

> "the improvement relates to effectually preventing hot coals passing from the chimneys of locomotives by a peculiar manner of arresting them before they get to the chimney."

The specification then goes on to describe the relation of the chimney or smoke-stack to the smoke-box or "smoke-head," and then states:

> "In the unoccupied space in this smoke-head we place a grate, formed either with bars or of netting, or perforated plates; the shape is not material; we make them circular, as being most convenient in ordinary cases."

The specification further states:

> "It will be seen that nothing but smoke and gas can pass the top netting F, and that no coals or dangerous sparks can pass into the chimney, they being arrested by the grate D, without having received any impulse from the exhaust pipe. The strong draft created by the exhausting steam up the pipe into the chimney brings the coals and sparks to the grating, against which they strike and fall harmless into the space in the smoke-head. The force of coals drawn from the fire when impelled by the exhaust steam up the chimney is such as to cut through netting, and even cast-iron over a quarter of an inch thick, in two or three months, in any description of spark-arresters located in the smoke-stack."

It is apparent from these quotations from the original specification that when they filed their application Kearney and Tronson believed themselves to be the first inventors of, and asked a patent for, a spark-arrester of any kind placed in the smoke-box of a locomotive in contradistinction to a spark-arrester placed in the smoke-stack. It is also apparent that in their opinion the material of which the spark-arrester was made or its form was immaterial. Such spark-arrester might be "formed either with bars or of netting or perforated plates." Either one of such forms could be used effectively; it made no difference which. The material thing, and their invention, was the location of the spark-arrester in the smoke-box. Accordingly, one of their claims was—

> "2. Combining a spark-arrester with the smoke-head of a locomotive in the manner and for the purpose hereinabove set forth."

The only other claim was—

> "1. The grate D, pipe E, the net or grate F, as and for the purpose specified and shown;"

this claim covering the combination of the petticoat pipe with the gratings at the bottom and top thereof.

The application was duly examined and a patent was refused upon the ground that the invention was anticipated by a patent granted to James L. Vauclain, August 20, 1861, No. 33,114, being the Vauclain patent heretofore referred to.

After this action by the Patent Office the specification was altered so as to make the form or construction of the grating the invention claimed. What before had been said to be immaterial was now made the material thing for which a patent was asked.

This clearly appears from the following extracts from the original and amended specifications:

Original.	*Amended.*
"In the unoccupied space in this smoke-head we place a grate formed either with bars or of netting or perforated plates; the shape is not material; we make them circular, as being most convenient in ordinary cases. "It is best there should be a clear space on all sides or around the grate."	"In the unoccupied space in the smoke-head we place a suitable grate, the peculiar features of which are its perpendicular bars with fixed apertures sufficiently fine to stop the sparks that come from the fire; the size of the grate being determined by the area of opening needed for the regular draft and escape of smoke on kindling the fire, or when the engine is not in motion."

Original second claim.	*Amended claim.*
"Combining a spark-arrester with the smoke-head of a locomotive, in the manner and for the purpose hereinabove set forth."	"What we do claim as our improvement, and desire to secure, is the grate D with longitudinal bars as and for the purpose specified and shown."

They also inserted a disclaimer of the construction shown by Vauclain.

This change of specification was not entirely satisfactory to the examiner, and, having doubtless in his mind the fact that other inventors,—as, for example, Ethelred May in his patent No. 17,884, granted July 28, 1857, Defendant's Exhibit H, had recognized the advantages of a spark-arrester in the smoke-box over a spark-arrester in the smoke-stack,—he required the erasure of certain language from the specification referring to the disadvantages of placing the arrester in the stack. These words form the final part of the paragraph already quoted, namely:

> "The force of coals drawn from the fire when impelled by the exhaust steam up the chimney is such as to cut through netting, and even cast-iron over a quarter of an inch thick, in two or three months, in any descriptions of spark-arresters located in the smoke-stack."

After the erasure of these words by applicants the patent issued with the following claim:

> "The grate D with longitudinal bars, as and for the purposes specified and shown."

This claim, fairly interpreted by the specification and drawing, covers the combination, in a smoke-box of a locomotive engine, of a petticoat pipe with a spark-arresting grating composed of longitudinal bars, and as no other form is described in the specification or illustrated, and the grating is designated by the reference letter D, the grating of the combination must be of the form shown in the drawings of the patent, namely, a series of long bars placed vertically with correspondingly long openings between them extending from the top to the bottom of the grating.

Keystone Bridge Co. *v.* Phœnix Iron Co., 95 U. S. 279.
Wier *v.* Morden, 125 U. S. 98.
Hendy *v.* Golden State, 127 U. S. 370.
Knapp *v.* Morss, 150 U. S. 221.
Wollensak *v.* Sargent, 151 U. S. 221.

This rule was applied by Mr. Justice Jackson upon the circuit in—

McCormick Co. *v.* Aultman, 58 F. R. 773.

Fig. 1.

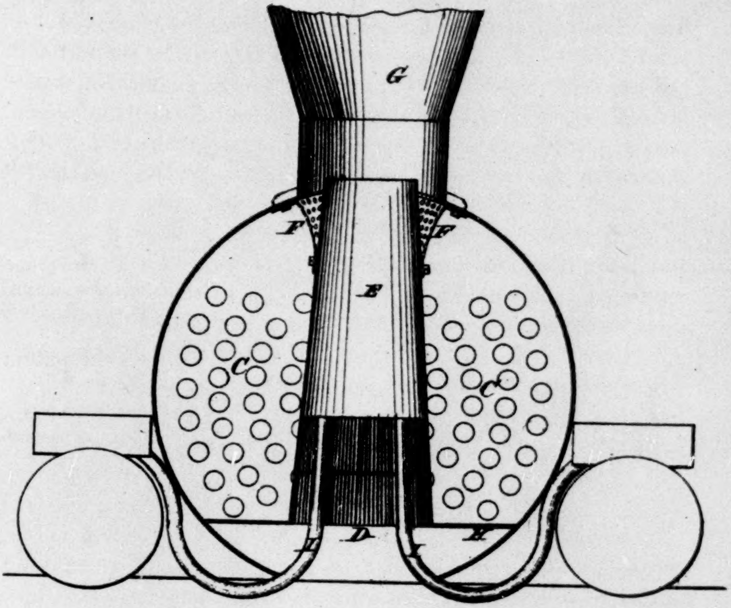
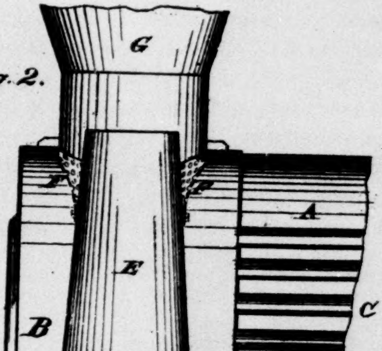


Fig. 2.



THE KEARNEY AND TRONSON REISSUE.

It is to be observed that, although the patent was limited to the use of vertical bars, there was nothing either in the specification or in any argument of the attorney showing any new result produced by the use of such bars, or any reason why they were patentably different from the netting or perforated plates *which Kearney and Tronson had originally said were equivalent devices.*

It is true the attorney points out what he conceives to be certain disadvantages in the use of the Vauclain arrester, but these were such as grow out of the arrangement by which Vauclain adjusts the size of his slot-like perforations, and had no reference to the shape of them.

It would seem, therefore, that the limitation to the vertical bars was simply for the purpose of getting a patent, and not because there was any special virtue in this form of grating.

THE REISSUED PATENT.

The original patent was, as has been seen, granted April 11, 1871. Some fourteen months after its issue, June 7, 1872, Kearney and Tronson surrendered it and made application for a reissue thereof. The file-wrapper and contents of the reissue application are in evidence as Defendant's Exhibit F (Record, page 99).

The specification of the reissue application was entirely changed in form from the original, and practically the matter which was erased from the original at the requirement of the Patent Office was restored. As to the construction of the spark-arresting grating, the following language was used :

> "In the construction of the grating E [should be D] we prefer to use vertical bars as shown in the drawing, but any style or kind of grating may be used that will prevent cinders or sparks from entering the petticoat pipe, such as a perforated surface or a grating formed in any manner desired, and the apertures or perforations may be regulated in size and area of surface covered by the amount of opening required for the regular draft and escape of smoke on kindling the fire, or when the engine is not in motion."

Here we have, again, a distinct statement that the form of the grating is not material but that any kind of apertures or perforations may be used. The only requisite is that they shall be such as to "prevent cinders or sparks from entering the petticoat pipe." The inventors thus, after mature reflection, again sought to obtain a patent which ignored the fact that there was any difference between their vertical bars and any other form of grating to be placed in locomotive smoke-boxes.

As to the disadvantages of arresting the sparks in the smoke-stack, and the advantages of arresting them in the smoke-box, there is the following statement:

> "Our improvements relate to providing locomotives with a suitable device for preventing live coals, cinders, sparks, and like substances which may leave the furnace in passing into or out of the smoke-stack, and to retain them in the smoke-box, from which place they may be removed at pleasure.
>
> "It has heretofore been the practice to cover the tops of smoke-stacks of locomotives with a wire netting or grating for the purpose of preventing the escape of sparks and cinders, and in some cases an inverted metal cone is also placed in the center of such netting or grating to receive and break the force of the cinders as they are thrown against it.
>
> "In all these contrivances the cinders receive so much force from the exhausting steam whilst on their way up the petticoat pipe and smoke-stack that they very soon destroy the netting or grating placed at the top of the smoke-stack, and, where a cone or other device is used to turn the cinders downwards and partially protect the grating, the gases are also retarded in their escape.
>
> "In order to overcome these difficulties, we place a grating D at or near the lower end of the petticoat pipe E." * * *

The reissued patent also contained the description and illustration of a piece of boiler plate or sheet-iron placed at the bottom of the smoke-box to provide a flat surface for the grate to rest upon and having holes for the passage of the exhaust pipes. This plate is lettered H in the reissue drawings and was not shown or described in the original patent, unless in the original drawing a faint line running across the smoke-box may be said to be such plate.

A further change was the omission of the disclaimer set forth in the original patent and the addition of a claim for matter not claimed in the original patent, but for which a claim was originally made and erased.

The claims of the reissue application as filed were as follows;

> "1. Placing a grating in the smoke-box of a locomotive to prevent sparks or cinders entering the petticoat pipe, substantially as described and shown.
>
> "2. The combination of the grating D with the netting F, substantially as and for the purpose described and shown."

These, it will be seen, are substantially the same claims which were made when the original application was first filed and afterwards abandoned.

The reissue application, having been examined, was rejected upon the patent to Vauclain, upon which the original patent had been rejected, and two other patents, namely, Weidman, Major and Sample, December 20, 1870, and James Smith, March 7, 1871, both of which are in evidence and the first of which has been heretofore referred to, and the second, Smith, describes a spark-arrester in the smoke-box made either from wire netting, a bar of iron coiled spirally, or a series of cast-iron rings strung together.

Upon this rejection Kearney and Tronson struck out the two claims originally made, substituting two others, the second of which was substantially the same as the original second, and the first of which limited the invention to the specific form of grating shown.

An amendment was also made to the specification, erasing the matter which provided that the form of grating was immaterial, and limiting the invention to the vertical bars.

The paragraph inserted into the specification is as follows:

> "We construct the grating D with straight vertical bars of iron placed at small distances apart, but these spaces should be such, in the aggregate, as will be sufficient for the draft and escape of the smoke on kindling the fire, or when the engine is not in motion."

The claims are as follows:

> "*First.* The grating D, with vertical bars placed at the foot of the spark or petticoat pipe E, in the manner and for the purpose substantially as described.
>
> "*Second.* The combination of the grating D with the netting F in the manner and for the purpose substantially as described."

The patent thereupon issued in its present form.

THE REISSUED PATENT INVALID.

As to this reissued patent, the appellant contends:

First. The reissued patent is invalid because the device covered by the claim thereof is not patentably different from other spark-arresters which had long preceded it in the art.

The claim of the reissued patent is, as has been seen, restricted to a grating provided with vertical bars at the base of a petticoat or spark pipe.

From a consideration of the proceedings in the Patent Office during the pendency of both the original and reissue applications, we have seen that, in both, Kearney and Tronson declared that the form of their grating was immaterial and that it might be made either from bars or netting or perforated plates. The prior patents referred to by the Patent Office, namely, Vauclain, Weidman, Major and Sample, and Smith of 1871, show all of said forms of grating, and by their act in cancelling from both applications a broad claim for a grating of any construction Kearney and Tronson must be held to have admitted that what they originally supposed was their invention was anticipated by these patents.

In addition to the patents cited by the examiner, other prior patents were introduced by the appellant which still further show the state of the art. These patents have been before referred to. They are Hubbell, May, Sweet, and Smith of 1870, and show that long prior to Kearney and Tronson spark-arresters had been made from wire-netting, from perforated plates, and with horizontal bars.

This being the state of the art, it was incumbent upon Kearney and Tronson, before they could have obtained a valid patent, to make some advance in the art, to produce some new or improved result by the grating composed of vertical bars, the construction which they adopted. It was not enough that they should simply change the form of their grating. Something must be accomplished by the change.

For the statement of any such result we search in vain through both patents and both applications. The only advantage stated is due to the use of a spark-arrester in the smoke-box, which was not original with Kearney and Tronson, and to the use of a non-adjustable device instead of one adjustable like Vauclain's, non-adjustable spark-arresters, antedating theirs by twenty years. Nor do we find any such advantage clearly shown by the proofs.

So far as the record shows, a spark-arrester of the form shown in their patent was never used except in three instances, namely, upon five locomotives on the Morris and Essex Railroad, upon one on the Central Railroad of New Jersey, and upon one on the Troy and Whitehall Railroad. (Record, pages 45, 46.)

In the case of the Morris and Essex, Kearney and Tronson were employees of the road, and Tronson was master mechanic, with power to put such devices into use.

Upon the other two roads the use was merely experimental, and Kearney and Tronson never received any pay therefor; nor did they ever sell the right to use their device to any railroad company. (Record, page 46.)

Further, in the case of the Kearney and Tronson device, the use on the Morris and Essex Railroad continued only a year or so, when it was ordered to be taken off by the superintendent of the road, Andrew Reasoner, because, as he states,—

> "The locomotive did not work well; did not do its duty with that device in; it clogged up."

The order for the removal was based upon an unfavorable report as to the operation of the device by William H. Lewis, who succeeded Tronson as master mechanic, and thereafter such device was never used again. (Record, page 89, Q. 6.)

Mr. Lewis was called by the defendant and testified as to the discontinuance of the use of the Kearney and Tronson device, its disadvantages, and the use, in place of it, of a spark-arrester composed of a wire netting placed in the smoke-stack. He says :

> "I discontinued their use in 1872 ; * * * The cause of taking them out was because the engine did not make steam enough, or steam sufficient to do the work required of them. The grating clogged up with sparks and shut off the draft." (Record, pages 90, 91.)

The device substituted was the diamond stack, and here it may be asked, if Kearney and Tronson's spark arrester, as claimed by the appellees, possesses such great advantages over the diamond stack, why did the Morris and Essex Railroad Company take off their device and restrict itself to the diamond stack?

In addition to the testimony of these purely disinterested witnesses as to the failure of the Kearney and Tronson device upon the Morris and Essex Railroad, there is in evidence an account of practical tests which were made by the Lehigh Valley Railroad Company with various forms of gratings having both vertical and horizontal openings and also made of wire netting, with the result that the screen with the vertical openings was found to be the least advantageous, the screen with the wire netting the most advantageous. These experiments were conducted upon locomotives in actual daily and ordinary use under the personal supervision of Mr. Brevoort, who gives a full account of them (Record, pages 76, 77).

The comparative efficiency of each of the forms experimented with is clearly shown in the three photographs, Defendant's Exhibits B, C, and D, which were taken immediately after the conclusion of each experiment, B being the alleged infringing screen, C a screen with horizontal perforations, and D a screen of wire netting. The care and perfect fairness with which these experiments were made are established by the testimony of Mr. Brevoort, and also of John I. Kinsey (Record, page 63), and Monroe D. Musick (Record, page 69).

The conclusion reached by these witnesses is corroborated by Lawrence F. Bachman, a locomotive engineer, in the defendant's employ, who says:

> "I find in my experience that the wire netting is the best form, and I prefer it to either of the castings which were made with round holes, or elongated holes; * * * with the casting with long holes, while it would stay open, the engine would steam well, but would clog up in about eight or nine miles; with the wire-gauze netting I found that the engines steam better than with either of the other forms."

It is also corroborated by Alexander Mitchell, who says, with respect to the different forms of spark-arrester shown by Exhibits B, C, and D:

> "I have seen devices like all three of said photographs in use on locomotives; * * * and being asked which, in my opinion, is the best adapted for the purpose, I say Exhibit D; the one showing the wire netting is the best; I experimented with a screen like that shown by Exhibit B in the year 1876; my experience with it was not satisfactory, for the reason that the slots would become clogged and larger particles could get through the holes than with a square net or wire screen such as is shown by Exhibit D."

He further testifies:

> "Q. 7. In your opinion, is it material whether the screen is made from a perforated plate—that is, from a piece of sheet-iron with holes punched in it—or from cast metal plates, or from netting?
>
> "A. I can answer by saying what I prefer, and which I found the best in practice—that is, wire gauze.
>
> "Q. 8. You have had experience with both the wire gauze and cast metal plates, such as are shown by Exhibit B, have you not?
>
> "A. I have.

"Q. 9. And you come to the deliberate conclusion that the wire gauze is the best?

"A. I do." (Record, pages 59-60.)

Mr. Mitchell is an old railroad man; has been familiar with the construction of locomotives since 1852; was originally a machinist and worked in locomotive shops; has been a railroad master mechanic and division superintendent since 1864, and is an inventor and patentee of spark-arresting devices. He is therefore both theoretically and practically familiar with the construction of locomotives and the operation of spark-arresters.

Opposed to his testimony is that of the complainants' expert, Drake, who states that he has never had any practical experience with the use of spark-arresters in locomotives, has never made any experiments with screens or gratings having different shaped openings, and that his opinion that one form of opening is better adapted than another for arresting sparks and retaining them within the smoke-box is based upon theory rather than practice (Record, pages 56-57). Mr. Drake, however, admits that as to the spark-arresters shown in Exhibits B, C, and D, if the conditions under which they were experimented with were in every respect the same, he "should be, of course, forced to the conclusion * * * that Exhibit B was more clogged than either of the other devices."

There is also the testimony of three witnesses, Durand (Record, page 131), Malay (Record, page 135), and Force (Record, page 136), locomotive engineers who ran locomotives provided with a spark-arrester which they say was the Kearney and Tronson, but upon being shown the drawings of the patent none of these men can identify the construction there shown with the spark-arrester in use on their engines, and none of them testifies to any fact indicating that any advantage was gained by the use of whatever device they did use, even assuming it to be like that shown in Kearney and Tronson's patent, over wire netting or horizontal bars.

Force, who is employed on the New York Elevated Railroad, says, however, that the engine which he now runs is provided with a spark-arrester made of wire netting, and that it works successfully (Record, page 141).

Durand makes a sketch of the spark-arrester, as he remembers it, which was in use upon the engine which he ran upon the Central Railroad of New Jersey (Durand Sketch No. 2), from which it appears that it was more like wire netting than like Kearney and Tronson's vertical bars.

The only other testimony upon this point is that of Kearney, one of the patentees, which is to the effect that with a grating provided with vertical bars there was found a better draft, more uniform working, and better escape for the gases and smoke than with other forms of arrester with which he and his co-inventor experimented; but nothing is said by him to fix definitely the exact construction of these other forms, so that a fair basis of comparison is wanting. His testimony is, however, entirely at variance with the statement which he twice made and swore to in his applications for patents—that horizontal and vertical openings and wire-nettings are equivalent devices.

A fact strongly corroborative of the appellant's contention upon this point is that, as appears in the testimony taken before the master, the Pennsylvania Railroad Company, over whose tracks Lehigh Valley trains are run into Jersey City, required the removal from the Lehigh Valley engines of the spark-arresters provided with the elongated openings, and the substitution for them of wire gauze, for the reason that the slotted arresters threw out too much fire and were therefore dangerous. (Kinsey, Record, p. 172).

It is therefore insisted upon the part of the appellant that it is not shown that the Kearney and Tronson arrester with its vertical bars is productive of any better result, or even so good a result, as was accomplished by older and prior devices. Instead of making an advance in the art, Kearney and Tronson made a backward movement, the preponderance of evidence being that, of all forms of spark-arrester, that one provided with vertical slots or openings is the least advantageous.

Besides this, Kearney and Tronson were both experienced and practical railroad men ; they both solemnly declared the equivalency of the various forms of openings, and that which form was used was entirely immaterial. They undoubtedly believed this declaration to be true when they made it, and they should be bound by it. If it was true when made, it is true now, and by their own showing Kearney and Tronson gave nothing to the public, and can therefore take nothing by their patent. Their particular construction of grate with the long vertical bars, being a mere equivalent of the grates shown in prior patents, is not a patentable invention but a mere change of form, and it is therefore submitted that their patent should be declared invalid upon this ground alone.

Upon this point the court below asks if the Kearney and Tronson spark-arrester had no superior utility over the old form of grate, why did the defendant use it ? To this it is replied, the spark-arresters with vertical slots or perforations which were used upon the Lehigh Valley Railroad were devised by its own employees and are materially different from Kearney and Tronson's, and there is nothing in this record to show that in constructing and adopting them any instruction was derived from the Kearney and Tronson patent, or that the defendant had any knowledge of such patent. The proof is that the screens complained of as infringements were used in ignorance of the complainants' patent, and were taken out upon notice that they were claimed to infringe it (Kinsey, 172–173).

The first arrester tried by the defendant provided with the vertical openings was originally constructed under the patent to Alexander Mitchell, one of its employees, No. 178,181, May 30, 1876. This arrester originally was provided with round perforations, but was afterwards changed so that the perforations were elongated. This arrangement proving un-satisfactory, wire netting was substituted. The cage or grating of the spark-arrester held to infringe does not differ materially from that made under the Mitchell patent. (Mitchell, Record, p. 59, Defendant's Exhibit Mitchell Patent, and Defendant's Exhibit Mitchell's Improved Spark-Arrester.)

This form was devised by Mr. John I. Kinsey, who was the master mechanic of the Lehigh Valley Railroad Company, who had no knowledge of the Kearney and Tronson patent until their claim for infringement was made, and never saw a spark-arrester with vertical slots before the idea of using such slots occurred to him. (Record, pages 161 and 172.) The only reason why he put such an arrester upon the locomotives under his charge was because he thought the cast screen was a little cheaper to make and apply than the wire netting. In this, however, Mr. Kinsey says he was mistaken, and that in reality the wire netting is cheaper in the end. He also found that for the purpose of retaining sparks the wire netting was the best. (Record, pp. 171-172.)

It is therefore submitted that there is nothing patentably novel in the screen of the Kearney and Tronson patent, and that such patent should therefore be declared to be invalid.

Non-Infringement.

There is no dispute as to the form of the spark-arrester used by the appellant. It is best shown in the blue-print, Defendant's Exhibit A, herewith reproduced. With this arrester it is to be observed there is used a deflector or diaphragm placed immediately in front of the opening of the flues into the smoke-box, the purpose of which is to deflect the sparks coming through the tubes to the bottom of the smoke-box before they are in any manner brought in contact with the surface of the arrester itself. This deflector enables appellant to dispense with a petticoat pipe with its opening at the top.

at numerous points above them are placed small knobs or projections. Instead, therefore, of being provided with vertical bars separated by corresponding openings of the same length, appellant's screen is simply made of plates provided with perforations such as are within the scope of the patent to May granted in 1857, which, although its drawings show a screen made of wire netting, in its specification and claim distinctly states that such screen may be made from *perforated plates*, and, of course, such perforations would be made, by one skilled in the art, of a size sufficient to accomplish the desired result.

Upon this point attention is particularly directed to the patent to Vauclain, granted ten years before Kearney and Tronson's, which shows slots relatively larger than appellant's, and which are described in the specification as *perforations* and as slots. When, as applicants, Kearney and Tronson struck out from their specification the language denoting the equivalency of bars and perforations, they must be assumed to have included perforations in the form of slots or elongated openings such as are shown in the patent to Vauclain.

Here the Smith patent of 1871 may be referred to as showing the equivalency, as materials for the construction of spark arresting gratings, of wire gauze, wrought iron with substantially horizontal perforations, and cast-iron rings separated by horizontal spaces or slots, all of which forms are described in the specification of the patent.

As to the arrester of this patent, it is said in the opinion of the court that its "coiled wrought-iron bar and these cast-iron bars or rings approach very near to the invention patented to the plaintiffs," but the patent is dismissed from consideration for the reason that although it was granted about a month before Kearney and Tronson's, the application for Kearney and Tronson's was filed two months before the date of Smith's patent, and the filing date of Smith's application was not shown. It is, however, submitted that as

Kearney and Tronson modified their claim upon the citation of this very Smith patent by the Patent Office, they must be assumed, for the purposes of this case, to have conceded that the Smith patent is to be taken into consideration in any future construction of their claim and be given its full limiting effect, whatever that may be.

Another important distinction is the absence from appellant's device of a petticoat pipe, its place being taken by a downward extension of the smoke-stack, and by a special deflector to drive all the *cinders* to the *bottom* of the smoke-box.

A petticoat pipe is a well-known mechanical contrivance, conical in form and open at both ends, as its name indicates, and its function is to induce a draft or suction at both ends from the smoke-box into the chimney, or, in other words, to produce two lines of draft in the smoke-box, one from its lower and the other from its upper end. This result cannot be accomplished by a tightly-fitting downward extension of the smoke-stack, such as is used by appellant, as by it there is but one line of draft established, and all the contents of the smoke-box are compelled to pass in at its lower end.

This distinctive difference between the petticoat pipe and the downward extension of the smoke-stack is made clear by the witnesses Wm H. Lewis and John I. Kinsey.

Lewis (Record, p. 90) says substantially that what mechanics understand as a petticoat pipe is one giving bottom and top draft by having the top of the petticoat smaller than the stack, because it is smaller at the top than the chimney and wider at the bottom.

> "I understand that if the stack is extended downward it is merely an extension of the smoke-stack and not a petticoat pipe."

And on page 92, in answer to last question :

> "Then do I understand you to say that a downward extension of the smoke-stack and a petticoat pipe are two different and distinct things?
>
> "A. Yes."

Kinsey (Record, pp. 65–66) says, substantially:

The pipe shown in Exhibit A is not a petticoat pipe. The escape of steam, smoke, &c., in such a construction is by entering the extended smoke-stack at its base. In a petticoat pipe the escape is by entering at the top of the petticoat pipe into the smoke-stack where a petticoat pipe is used. The exhaust will not form so strong a draft at the bottom as at the top in said Kearney and Tronson patent. In the Lehigh Valley's device all the draft is through the spark-arrester, because it has no other outlet. If there were an outlet at the top as in the Kearney and Tronson patent, the force of the draft would be lessened. If the draft were lessened it would clog.

Appellees' own witnesses, Quinn (p. 38), Breisch (pp. 40–41), and Kearney (p. 48), admit that appellant's structure does not contain a petticoat pipe.

Clearly the pipe used by appellant is not a petticoat pipe.

In considering the question of infringement, in which the absence from appellant's spark-arrester of the petticoat pipe becomes of great importance, it should be noted as a significant fact that appellees admit that such arrester does not infringe the second claim of their patent.

Mr. Drake, their expert, says (Record, p. 52):

> "I do not find the subject-matter of the second claim in the blue-print drawing, Exhibit 'A,' nor in Exhibits 3 and 4, as the petticoat pipe in the blue-print and in Exhibit 4 for complainants appears to telescope into the smoke-stack or pipe without leaving any opening between the two, in which case there is no need of the wire netting which is shown in complainant's patent and embraced in the combination in the second claim thereof."

Mr. Kearney says (Record, p. 48):

> "Q. Then the combination set forth in the second claim of the reissued patent is not infringed by the defendant?
>
> "A. We don't claim that it is.
>
> "Q. Then it is only the first claim that you think is infringed?
>
> "A. The grate with the upright bars is what we think is infringed"

It is therefore admitted on the part of the appellees that there is a difference between their device and the device of Kearney and Tronson, which difference is obvious from a comparison of the drawings illustrating such devices, namely, that the petticoat pipe open at both ends, and the upper screen F of the Kearney and Tronson patent, or any equivalent thereof, are not found in appellant's spark-arrester. As shown by Mr. Drake, this upper screen is not necessary with appellant's arrester, because the pipe to which it is attached is simply a downward extension of the smoke-stack, but it is necessary with the appellees' arrester, because the petticoat pipe is open at its upper as well as at its lower end, and, being smaller in diameter than the smoke-stack, a space is left between the top of the petticoat pipe and the bottom of the stack which must be bridged by a screen, otherwise sparks of a large and dangerous size would be carried freely into the smoke-stack and discharged into the atmosphere. This necessity is made clear by the specification of the patent, as follows:

> "In order to overcome these difficulties, we place a grating, F [should be D], at or near the lower end of the petticoat pipe E, so as to surround the exhaust pipes I I, and prevent any cinders or sparks entering the pipe E, while allowing free passage for the smoke and gases. We also place a grate or netting F around the top of the petticoat pipe to cover the aperture left between it and the smoke-stack, in order to arrest any sparks or cinders that may be drawn to that point."

It is nowhere suggested that this upper grating or netting can be dispensed with. On the contrary, throughout the specification it is made just as essential as the lower grating, and obviously the device as a whole would not operate successfully without it.

If this is so, and we think it so obvious as to be beyond dispute, appellant's device does not infringe, because it does not embody certain devices which are essential to the operation of appellees' apparatus. In other words, if appellant does not use the petticoat pipe of the patent, it does not make use of the invention set forth in the specification of the patent.

It does not use the invention because it does not use the same combination of devices. The concluding words of the first claim: " in the manner and for the purpose substantially as described," must, if they mean anything, be taken as referring to all the essential elements which are described in the specification as co-operating to produce the desired result.

It is well settled that a claim to a combination which is defined to be "substantially as described" is thereby limited to the elements which are described in the specification as composing it.

Hailes *v.* Van Wormer, 20 Wall. 353.

So, too, when the arrangement of the machine is such that the combination of all its several elements or their mechanical equivalent is necessary to its successful operation, claims to a limited number of these elements should fairly be construed to include the rest.

Wicke *v.* Ortrum, 13 Otto, 461.

It is also well settled that a combination must be maintained as an entirety and that it is not infringed if any of its material parts are omitted.

Water Meter Co. *v.* Desper, 11 Otto, 332.
Eames *v.* Godfrey, 1 Wall. 78.

Coming now to a consideration of the claim as we find it in the patent, it reads:

> " The grating D with vertical bars placed at the foot of the spark or petticoat pipe E, in the manner and for the purpose substantially as described."

With respect to this claim, Mr. Brevoort says (Record, p. 74):

> "This claim, as I understand it, is for a combination of parts. The first element of the claim being the grating D, having the vertical bars, which grating is located at the lower portion of the petticoat pipe E, which is the second element referred to in the claim, and I think the invention claimed is the combination of a grating thus made with vertical bars attached to the bottom of a petticoat pipe. By the terms of the patent I understand that a petticoat pipe, as such, is a necessary part of the invention of the said first claim; the pipe being a petticoat pipe of the ordinary description, conical in form and open at both ends. This is my understanding of the invention covered by the first claim."

And this, for the reasons above set forth, we believe is the only true construction that can be given to the claim.

Such a construction is fatal to appellees' case, and is not what Mr. Kearney understands or contends for. He bases the claim for infringement solely on the fact that the perforations or slots in the castings used in the construction of defendant's screen are longer vertically than they are wide.

In his deposition, he says (Record, page 48):

> "Q. What makes you think that the use of a spark-arrester like that shown by the blue-print 'Exhibit A' would be an infringement?
>
> "A. Because of having the upright openings.
>
> "Q. Is that all?
>
> "A. That is all."

And on page 49:

> "Q. Then, as I understand you, your claim for infringement lays solely upon the fact that the defendant's screen is made with vertical openings; is that correct?
>
> "A. That is correct."

And this conclusion is reached after admitting that in all other particulars of construction and arrangement of parts the two devices are different. For instance, that the upper netting is not shown in the blue-print; that the shape of the grating is different, one being wider at the top than at the bottom, while the other is wider at the bottom; that the perforations or openings in appellant's screen are arranged ziz-zag, while in Kearney and Tronson's the spaces between the bars are arranged parallel to each other; that in appellant's screen there are some *five* or *six* sets of *holes* or *perforations* arranged to break joints, while their screen is made of parallel rods or bars producing long openings; that appellant's screen has deflecting projections arranged between the openings, while theirs has no such projections and can have none; that their screen is located near the bottom of the smoke-arch, while appellant's is located at a much higher point.

Admitting all these distinctive differences to exist between the two devices, Mr. Tronson still claims infringement because the openings are "upright." He admits that if the openings were made longer laterally than they are wide they would not infringe, or if they were rectangular, as in netting, they would not infringe; and he takes no account of the proportionate length of the openings, or how they are relatively arranged or formed, evidently believing that he is entitled by his patent to cover broadly the use of a screen having vertical openings.

The claim, it is hardly necessary to say, is not capable of such a broad construction. *It is too plain for argument that a screen may have vertical openings or perforations without having vertical bars.* To come within the scope of the claim two things of specific construction and arrangement must be used:

First. A grating D made of long, straight vertical bars of iron placed at small distances apart, as described in the specification and shown in the drawing.

Second. A petticoat pipe E, such as is shown and described, that is open at top and bottom and extending from within the base of the smoke-stack down into the smoke-box.

It is evident from the mere inspection of the two devices as illustrated in the drawings that the appellant's structure does not embody these features of construction and arrangement.

It is further evident that, whether the first claim of the patent be construed as a claim for the construction of the grating considered as a separate structure or for the combination of a grating of Kearney and Tronson's construction with a petticoat pipe, there is no infringement of such claim.

With respect to this question, Mr. Brevoort, after giving his reasons at length, concludes as follows (p. 80):

> "Therefore, I do not think that the defendant's apparatus has either the grating of the patent made up of vertical bars 'placed at small distances apart,' and neither has the defendant's apparatus a petticoat pipe within the smoke-box, within the terms, as I understand it, of the Kearney and Tronson invention, and for these reasons I do not think that the defendant's apparatus contains the invention of the first claim of the said patent."

But, says the learned court below, the bars used by the appellant are the equivalent of the bars described in Kearney and Tronson's patent. To this we reply that the appellant does not use bars at all. The Kearney and Tronson patent shows a grating composed of single bars extending from the top to the bottom of such grating and with corresponding spaces between them, a single hoop-like strengthening band surrounding them midway between the top and bottom. Appellant's grating, on the other hand, consists of cast metal plates provided with slot-like perforations, such as were known in the prior art, the longest of which is a little over three inches in length, and the only thing which suggests any analogy to a bar is the metal intervening between the perforations. *As well might the vertical wires which run from top to bottom of the nettings in the wire screens be called bars.*

Considerable stress has been laid by the appellees upon the fact that their grating as they actually constructed it was made from cast metal, and the specimen section of it which they have introduced—Complainants' Exhibit No. 5—is so made. But there is not a word in their patent as to the material of the grating, except that it is to be constructed "with straight vertical bars of iron." They can therefore derive no advantage from the fact that appellant also casts its grating in sectional form—a form which, it may be said, is not in any manner indicated in the patent.

The court seems to have been influenced, in reaching its conclusions, by the contention of the complainants below as to the use of cast metal, and minimized the effect of the patent to Vauclain by indicating that the screen shown and described therein is made from sheet metal. As to this, it is to be said that there is no suggestion in the patent to Vauclain that its perforated cylindrical box or screen is so made. Nothing at all is said in the specification as to material; but as the screen is made in two parts, one of which fits upon and slides over the other, somewhat in the manner of a hot-air register, and as the inner of the two parts is provided with a bottom which, from the drawings, appears to be made in one piece with the sides, the most natural way to construct it would be by the operation of casting.

But in order that appellant's cast grating should come within the scope of the Kearney and Tronson first claim, such claim would have to be considered as covering a primary invention, and it is well established that inventors who are not pioneers but only improvers are not entitled to invoke broadly the doctrine of mechanical equivalents.

Kearney and Tronson are not pioneer inventors and are therefore not entitled to a broad range of equivalents. If their claim be construed broadly enough to include appellant's device, which is nothing but an iron casting provided with perforations, it would also cover the May arrester, which, as has been pointed out, was patented as long ago as 1857, has been public property since 1871, and is a grating made either of woven wire or perforated plates. In fact, appellant's device is more like May's than like Kearney and Tronson's, May having no petticoat pipe but merely a downward extension of the smoke-stack into the cage. Appellant's arrester may truly be said to be the May apparatus with slight differences in construction but obviously operating in substantially the same way.

When to this is added that appellant's spark-arrester was devised by its own employees without any knowledge of the Kearney and Tronson patent, and therefore without instruction from such patent, it was evidently an error to hold it liable as an infringer, especially in view of the fact that the patentees themselves twice made oath that the form of the openings in the screen is immaterial, and the further fact that it was shown by actual experiment and by the experience of the Pennsylvania Railroad Company derived from the running of Lehigh Valley trains over its tracks that, of all the forms of spark-arrester, that with wire gauze was the most advantageous, and that with the slotted openings the least advantageous.

The Reissue Illegal and Void.

In view of the circumstances in which the reissued patent was granted, the appellant urges:

First. The reissued patent is invalid because of the insertion of new matter into the specification which enlarges the scope of the original patent and makes it cover, if valid, a broader and different invention.

This new matter is that which describes the advantages of the spark-arrester in the smoke-box of the locomotive and the disadvantages of placing the arrester in the smoke-stack, and deliberately conveys the idea that this difference is due to the invention of Kearney and Tronson.

The effect of the insertion of such matter into the original, granting that the first claim of the reissue is the same in scope as the claim of the original, is to indicate that the spark-arrester covered by the patent possesses advantages not possessed by spark-arresters which had preceded it and *to enable Kearney and Tronson to invoke the doctrine of equivalents to the same extent as if they had been pioneer inventors, instead of narrow improvers.* To what extent this enlargement was made effective will be clearly seen when we come to consider the accounting and the basis upon which the gains and profits accruing to the defendant were computed. It is enough to say here that the patentees were allowed to recover the same sum for gains and profits as if they had been the first to place a spark-arrester in the smoke-box at the base of the petticoat pipe, or any other pipe, the comparison being drawn, not between the defendant's alleged infringing device and other old forms of spark-arrester placed in precisely the same relation to the smoke-box and pipe, but between defendant's device placed in the smoke-box and other spark-arresters which had been formerly placed in the smoke-stack.

As to this matter, also, there was no inadvertence, accident, or mistake in its omission from the original patent, since, as has been already seen, it was contained in the specification of the original application, was expressly objected to by the Patent Office during the pendency of such application, and was deliberately erased by the applicants.

Second. Such reissued patent is invalid because the original patent was not inoperative or invalid by reason of a defective or insufficient specification or any error in the original arising from inadvertence, accident, or mistake.

Assuming it to be true, as found by the court below, that the first claim of the reissued patent is substantially the same as the claim in the original patent,—so far, at least, as its claim was concerned,—the original was fully operative to cover the invention. Both the claim in the original and the first claim of the reissue cover alike a grating composed of vertical bars placed at the foot of the petticoat pipe.

As to the second claim of the reissue, there was no inoperativeness of the original due to the omission of such claim. The claim of the original was fully effective to cover the cage composed of vertical bars whether or not it was used with a pipe requiring an upper netting. Besides, there was no omission of such claim by inadvertence from the original patent, because, as has already been seen, substantially the same claim was made in the original application and erased by the applicants after the rejection of such claim upon the patent to Vauclain. This action upon their part, under the well-known decisions of this court, precludes them from reasserting in a reissued patent a claim deliberately abandoned in the application for the original patent.

Leggett *v.* Avery, 101 U. S. 256.
Goodyear Co. *v.* Davis, 102 U. S. 222.
Mahn *v.* Harwood, 112 U. S. 354.
Cartridge Co. *v.* Cartridge Co., 112 U. S. 624.
Crawford *v.* Heysenger, 123 U. S. 589.

So far as concerns the specification of the original, it is not defective or insufficient, but, on the contrary, is perfectly clear, describes with exactness the invention intended to be covered by the patent, and is sufficient to enable any one skilled in the art to construct the invention. This was admitted by one of the patentees and appellees herein, Francis Kearney, who, upon cross-examination as to the original patent, was asked :

> "Q. What I mean is, could not a mechanic, from reading your patent, understand how to make and use your invention?
> "A. I should think so." (Record, page 48.)

Nor was there, as stated in the opinion of the court below, any ambiguity or uncertainty in the original as to whether the invention applied—

> "only to cases where the tube E in the smoke-head was of less size at top than the smoke-stack or orifice in the smoke-head on which the smoke-stack stands, whereas the particular form and size of the tube E had nothing to do with the invention ;"

in other words, whether the invention was limited to the use of the arrester with a petticoat pipe or whether it covered also the use of the arrester with a downward extension of the smoke-stack.

In fact, the terms of the original specification upon this point are better capable of a construction broad enough to cover any form of pipe in the smoke-box than the specification of the reissue, which carefully describes the pipe as a petticoat pipe and in almost every instance refers to it by the reference letter E, it not having been the intention of either the original patent or the reissue to claim the grate except as located at the base of the auxiliary petticoat or spark pipe.

As to the insertion of the matter describing the base-plate, and the alteration of the drawing to correspond to this description, there does not seem to have been any necessity for this, since it was no part of the invention to support the cage upon such plate, and it could have been just as easily and effectively supported by the petticoat pipe, as was, in fact, the construction shown in the patents prior to Kearney and Tronson's, noticeably Vauclain and May. Any skilled mechanic would have given it suitable support.

Upon the question of inadvertence, accident, or mistake, the testimony of the inventor Kearney is instructive.

He was asked (Record, page 47):

> "Q. In what respect was said original patent of April 11, 1871, inoperative? You can look at the specification of the patent and point out any such defect, if any there may be, in it. (Witness is here shown certified copy of the Patent Office file-wrapper and contents, marked Defendant's Exhibit 'E' for identification.)
>
> "A. It was on account of the base-plate, if I understand, that the grating rested on.
>
> "Q. I do not understand your answer. What base-plate do you refer to?
>
> "A. The flat surface in the bottom of the boiler; that, I think, was one of the causes.
>
> "Q. There is no such plate described in the patent, is there, referring to the original patent?
>
> "A. I don't think there was. I couldn't say positively, but I think that is one of the reasons the reissue was gotten for—the flat surface.
>
> "Q. What were the other reasons, if any, that called for a reissue of the patent?
>
> "A. I think that was one of the principal causes. I can't recollect any other reason."

Upon his redirect examination, Mr. Kearney was further asked as to this matter (Record, page 50):

> "Q. Do you remember the grounds upon which the patent was reissued, or was that matter left to your attorney?
>
> "A. That was left to my attorney; Mr. Malcomson, I think, had that in charge; he got the reissue."

Recross-examination:

> "Q. Do I understand you to say, in answer to the last question, that Mr. Malcomson prepared the application for the reissue on his own responsibility?
>
> "A. He had charge of it.
>
> "Q. He prepared it, and you and Mr. Tronson signed it?
>
> "A. Yes, sir.
>
> "Q. And you left it to him to make the alterations that were considered necessary?
>
> "A. Yes, sir; I think he made the alterations."

The absence of inadvertence, accident, or mistake with respect to the omission from the original patent of a statement of the advantages arising from placing the spark-arrester in the smoke-box instead of in the smoke-stack has already been noticed in considering the question of new matter.

It is evident, therefore, not only upon the face of the patents themselves and from the Patent Office proceedings, but also from the admissions by the only one of the patentees who could testify, the other being dead, that the original patent was neither inoperative nor invalid by reason of a defective or insufficient specification; that, so far as the inventors knew, there was no error arising from inadvertence, accident, or mistake which called for correction by reissue; that there was the insertion of new matter enlarging and changing the invention; and that therefore the patent was reissued without sanction of law, as the same has been construed by numerous decisions of this court.

Russell *v.* Dodge, 93 U. S. 460.

Powder Co. *v.* Powder Works, 98 U. S. 126.

Ball *v.* Langles, 102 U. S. 128.
Swain Manfg. Co. *v.* Ladd, 102 U. S. 408.
Miller *v.* Brass Co., 104 U. S. 350.
James *v.* Campbell, 104 U. S. 356.
Heald *v.* Rice, 104 U. S. 737.
Mahn *v.* Harwood, 112 U. S. 354.
Coon *v.* Wilson, 113 U. S. 268.
Shepard *v.* Carrigan, 116 U. S. 593.
Gardner *v.* Hertz, 118 U. S. 180.
Ives *v.* Sargent, 119 U. S. 652.
Parker & Whipple Co. *v.* Yale Co., 123 U. S. 87.
Matthews *v.* Iron Clad Manfg. Co., 124 U. S. 347.
Yale Lock Manfg. Co. *v.* Berkshire National Bank, 135 U. S. 342.
Dobson *v.* Lees, 137 U. S. 258.
Electric Gas Lighting Co. *v.* Boston Electric Co., 139 U. S. 481.
Topliff *v.* Topliff, 145 U. S. 156.
Freeman *v.* Asmus, 145 U. S. 226.
Corbin Cabinet Lock Co. *v.* Eagle Lock Co., 150 U. S. 38.
Dunham *v.* Dennison Manfg. Co., 154 U. S. 103.

THE GAINS AND PROFITS.

The court below erred in taking as a basis upon which to compute gains and profits a comparison between the diamond stack and the straight stack used with appellant's screen.

It has already been stated that in computing gains and profits comparison was not made between the cost of the grating held to infringe and other old forms of spark-arrester placed in precisely the same relation to the smoke-box, and used with a straight stack, but between the appellant's structure and the diamond stack.

As to the diamond stack, it has been shown that it had been in use by the railroads of the United States long before

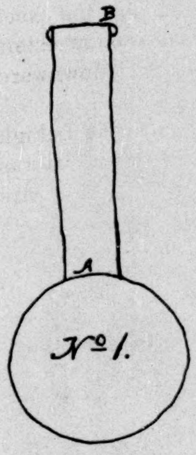
Kearney and Tronson's invention. The form of this stack is clearly shown in Complainants' Exhibit Boiler Stacks (p. 307). Its peculiarity is that at the top it is formed from two inverted cones with their large ends abutting, and at the point of abutment is provided with a wire netting and an internal cone.

It has also been shown that spark-arresters placed in the smoke-box and consisting of a wire netting, perforated plates, or a horizontally slotted cage and used with a straight smoke-stack are much older than Kearney and Tronson's invention, were public property as early as 1871 in almost the exact form of the alleged infringing screen, and that such arresters have been applied either to the petticoat pipe or a downward extension of the smoke-stack.

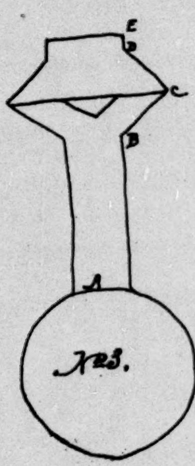
This being the state of the art, it was open to the Lehigh Valley Railroad Company to use the diamond stack. It was also open to it to use the straight stack provided with a wire netting or horizontal bars; in fact, it had used both, the form in which the netting was used being substantially like that shown in the patent to May, granted in 1857.

Upon this point Mr. H. Stanley Goodwin, then general superintendent of the Lehigh Valley Railroad Company, says (Record, p. 150):

> " Q. Look at Exhibit D. What arrester is that?
>
> " A. That is the arrester composed of wire netting.
>
> " Q. Do you know when that was first used by the company?
>
> " A. That, I should say, was used from immemorial and is now in use.
>
> " Q. Is that in general use at the present time on your engines?
>
> " A. I might say yes, it is in general use, although we have some modern devices, that are on some engines, which are somewhat different; but that is the one in general use.
>
> * * * * * * * * * * * *
>
> " Q. Since the use of coal on your engines have you used mainly the straight stacks?
>
> " A. Yes, sir; since I have been connected with the road.
>
> " Q. That is, since 1866?
>
> " A. Yes, sir.
>
> * * * * * * * * * * * *



Straight Stack.



Diamond Stack.

" Q. Has this arrester shown in Exhibit D, the wire netting, been in general use during years past?

" A. Yes, sir.

" Q. For how long?

" A. Well, I should say three or four years.

" Q. You think that it was in general use by the road to any extent before that time?

" A. Oh, yes, sir; years ago it was in use generally.

" Q. It was years ago?

" A. Yes, sir.

" Q. Then did it give way to something else?

" A. The wire netting?

" Q. Yes, sir.

" A. It never has given way to anything.

" Q. You said it had been in general use for some three to four years past?

" A. Yes, sir.

" Q. Was it before that time in general use?

" A. Yes, sir.

" Q. On what part of the road?

" A. On all parts of the road.

" Q. To what extent?

" A. Well, almost universally on all engines that used spark-arresters at all.

" Q. Were the cone and wire netting patterns discarded for the use of these arresters at the foot of the downward extension of the stack pretty generally years ago?

" A. Yes, sir."

John I. Kinsey, the master mechanic, says:

" x-Q. 41. When did the company on the Lehigh and New Jersey divisions first use a wire screen of the form shown in Exhibit D?

" A. In 1877, and is still in use on most of the locomotives."

Record, p. 67.

" Q. What arrester was in most general use at the time you first, in 1878, put on one with vertical slots?

" A. Wire netting, the same as Exhibit D.

" Q. Had that been used for a number of years?

" A. Yes, sir."

Record, p. 161.

" Q. I would like you to give a brief history of the spark-arresters which you have been using on your division, giving dates, where you can, as to the different devices used.

> "A. For what time back?
>
> "Q. Well, go back to 1869, say.
>
> "A. There has been some other stacks put on. The first we used was a diamond stack with a cone and screen. We then used a wire netting in the smoke-box, made in conical shape, the same as Defendant's Ex. D. As to the dates, I can't remember exactly. I cannot just call them to mind, when those were put in and taken out. After the wire netting was used, an iron grating was used with a vertical slot.
>
> "Q. Like Ex. B?
>
> "A. Yes, sir. After that the horizontal slots were used, the same as Ex. C. Then we substituted wire netting in a conical shape in the smoke-arch, three and a half mesh to the inch.
>
> "Q. The same as Ex. D?
>
> "A. Yes, sir; excepting it had no door in the front. It was just put together in two halves. Then, in addition to that, we put in the spark-boxes, and that we are using at the present time.
>
> "Q. Have you any recollection as to when you first began to use wire netting screens like Ex. D?
>
> "A. Yes, sir; in 1877 we put the wire netting in."

Record, p. 260.

The proof also shows that in 1883 the Lehigh Valley Railroad Company stopped using the screens with slots or perforations and returned to the use of wire netting for the cages of their spark-arresters. (Kinsey, Record, p. 67; Mitchell, p. 61, x-Q. 12; Van Horn, p. 175; Hall, p. 181; Hoficker, p. 250.) The form now used is shown in "Defendant's Exhibit Straight Stack" (p. 311).

Mitchell's testimony (p. 61) is particularly in point. It is as follows:

> "A. In 1876 the Lehigh Valley Railroad Company had ten engines constructed at the Grant Locomotive Works of Paterson, N. J.; those ten engines were furnished with a spark-arrester similar to my patent No. 178,181, except that they had a cast-iron screen inside of the lifting-pipe below; these cast metal plates at first, when they came, had round holes in them, which did not meet our expectations; we afterwards tried screens with oblong holes, as shown in the drawing I now produce in red.
>
> "(Defendant's counsel requests that the drawing produced by the witness be put in evidence, and the same is marked Mitchell's improved spark-arrester.)

"x-Q. 11. The red on this drawing shows a long vertical opening, does it not?

"A. It does.

"x-Q. 12. Were arresters of this pattern put on the ten locomotives above mentioned?

"A. They were, the lower screen, but they were removed and netting substituted.

"x-Q. 13. How long were they in?

"A. I don't know that I can give the exact time; I should say they were in from three to six months—long enough to give them a fair trial."

In his testimony upon the accounting, beginning on page 254, Mr. Mitchell states this matter still more clearly. He produces a drawing, "Defendant's Exhibit Mitchell No. 1" (p. 594), which shows the screen with round perforations which were afterwards changed to oblong perforations, this drawing showing the same construction as the "Exhibit Mitchell's Improved Spark-Arrester" (p. 589). He also states that the screen with the elongated perforations was taken out and a wire screen such as that shown in the "Exhibit Mitchell's Spark-Arrester Drawing No. 3" substituted (p. 590). This was some time during the summer of 1876.

If any further evidence as to the early use of wire screens in the smoke-box is needed, it is to be found in the testimony of William P. Henszey (Record, page 237), who is a mechanical engineer and has been connected with the Baldwin Locomotive Works, the leading establishment of its kind in the United States, for more than thirty years. He gives several instances of locomotives built in these works with spark-arresters in the smoke-box made from wire netting and provided with a straight stack as early as 1861. (Record, pp. 238, 239, 248, and 249.)

John Campbell (Record, p. 252) also testifies to the use in 1862 of a locomotive provided with a wire screen in the smoke-box, and a straight stack. A sketch of this device is in evidence as Defendant's Exhibit Campbell (p. 592), and is substantially like that shown in the May patent.

G. W. Strattan, one of the master mechanics of the Pennsylvania Railroad Company, also testifies (p. 290) that in the year 1869 the Pennsylvania Railroad Company began to use straight stacks with the Smith spark-arrester located in the smoke-box, and that in June of 1874 the Smith spark-arrester and straight stack were adopted as the standard for passenger engines. This Smith spark-arrester is shown in the two patents to Smith hereinbefore referred to, and the cages were made of wire gauze. The form of this arrester and stack is shown in the exhibit drawing entitled "Blue-print drawings offered by defendant referred to in Strattan's Afd." (p. 603).

Alexander Mitchell also states that as far back as the year 1852 or 1853 he saw an engine upon the Camden and Amboy Railroad provided with a straight stack and a spark-arrester in the smoke-box (p. 254).

The appellant therefore insists that the basis of comparison should have been the difference in cost between the alleged infringing grating and the grating which it had formerly used, or the gratings which it had a right to use, since they were covered by patents long since expired. The computation of the gains and profits upon the basis adopted by the court gives to Kearney and Tronson the same recompense as if they had been the original and first inventors of any spark-arrester placed in the smoke-box, instead of being the inventors of a definite and specific form of such arrester.

This, the appellant urges, is in contravention of the well-known rule for computation of profits.

This rule is clearly stated in Robinson on Patents, section 1145, as follows:

> "But, under the present doctrine of our courts upon this subject, where the product is producible by other means, or the saving might entirely or in part result from the use of other arts or instruments, the advantage derived by the defendant from the unlawful use of the patented invention cannot be measured by the difference between the gross amount of his receipts or savings and his expenses. The value of the use of an invention is held to be the value of the use of that new idea of means which the inventor has embodied and expressed in his article or process, and to which only the protection of his patent is ex-

> tended, since whatever inventions exist in the arts, open to the public at the date of his inventive act, may be employed by all, and to the whole community thus belongs already the entire benefit derivable from their unrestricted use. *When any new invention is perfected, therefore, the benefit that it confers upon its employer consists not of the whole advantage flowing from its use, but of the advantage it affords in excess of that obtainable by other means which have been previously bestowed upon the public.*"

This rule finds its authority in the decision of this court in Mowry *v.* Whitney, 14 Wall. 620, in which it was said:

> "The question to be determined in this case is: What advantage did the defendant derive from using the complainant's invention over what he had in using other processes then open to the public and adequate to enable him to obtain an equally beneficial result? The fruits of that advantage are his profits. They are all the benefits he derived from the existence of the Whitney invention * * * *It is the additional advantage the defendant derived from the process—advantage beyond what he had without it—for which he must account.*"

The rule has been approved and followed in many subsequent decisions of this court.

Littlefield *v.* Perry, 21 Wall. 205.
Goulds Manufg. Co. *v.* Cowing, 105 U. S. 253.
Black *v.* Thorn, 111 U. S. 122.
Tilghman *v.* Proctor, 125 U. S. 136.
McCreary *v.* Penna. Canal Co., 141 U. S. 459.

It is clear that if the court below had applied this rule it could not have properly awarded as gains and profits more than the difference between the cost of the cages consisting of wire netting used with a straight stack and those made from the perforated plates, also used with a straight stack. This amount was found by the master to be four hundred and seventy-one dollars and sixty cents, being a saving of two dollars and sixty-two cents per screen upon one hundred and twenty-eight locomotives as derived from Complainants' Exhibit Kinsey's Statement of Cost (p. 311).

Instead of this, the court based the gains and profits upon a comparison of the cost of the straight stack and its cast-iron grate and lift pipe with the cost of the diamond stack and its cone and netting, including also renewal of the netting, the labor of taking down the stacks for the adjustment of the new netting, and the entire renewal of the stacks when worn out, amounting in all to six thousand two hundred and thirty-five dollars and fifty-two cents.

The court below seems to have been influenced by what it deemed to be a fact—that appellant ceased the use of the wire netting and adopted the infringing grating because it was found to be better adapted to the purpose. The proof is, however, abundant, as we have already seen, that of all the various forms tried the wire netting was the best, and the only reason why the cast metal cage with its slots was adopted was because the master mechanic thought it could be made more cheaply. (Kinsey, Record, pp. 171–172.)

The most convincing fact of all upon this point seems to have been entirely overlooked by the court below, namely, that the Pennsylvania Railroad Company would not allow the Lehigh Valley engines containing the slotted screens to run over its road, but required them to use a grating composed of wire netting, the form required being shown in Defendant's Exhibit Blue-Print Spark-Arrester (p. 591).

In the opinion of the court, upon page 273 of the Record, it is stated that the grating held to infringe was used by the appellant until it was stopped by the injunction. It does not appear to what extent the court was influenced by what evidently appeared to it a wanton infringement, only stopped by its order, but here, too, there was manifest error, because the injunction was not granted until final decree, namely, September 30, 1887, no preliminary injunction having been granted, and it is in evidence that the Lehigh Valley Railroad Company ceased the use of the device held to infringe in 1883, when the suit was brought, substituted therefor the grating with the horizontal slots, discontinued that in 1886, more than a year before the injunction, and immediately adopted the wire screen, as it was required to do by the Pennsylvania Railroad Company, April 20, 1886 (Kinsey, Record, pp. 161, 172, and 173), so that the use of any grating made of cast iron provided with perforations, whether vertical or horizontal, was discontinued by the Lehigh Valley Railroad Company for more than a year before it could have been forced to discontinue by the grant of an injunction.

Again, the court seems to have given credit to the patentees for making their bars of cast iron. As to this, there are three considerations which seem conclusive:

First. There is not a suggestion in the patent that cast metal is to be used. On the contrary, the word "bar" is rather more suggestive of wrought metal than cast. Certainly no one will contend that it is not equally suggestive of wrought metal.

Second. There is no suggestion in any of the patents showing the prior art that cast metal is not to be used. May, it is true, speaks of sheet metal; but, as we have seen, the most natural way to make Vauclain's screen is from cast metal, and Smith of 1871, for one of his forms, specifies cast metal. If it be insisted that this Smith patent is not to be taken into consideration, because the invention covered by it has not been shown to antedate Kearney and Tronson's, it is only to be said that Kearney and Tronson, having modified their claim upon the citation of this patent by the Patent Office, must be assumed, for the purposes of this case, to have conceded their juniority.

Third. The proof does not sustain the proposition that a screen made from cast metal perforated plates can be relied on to last longer than one properly made from wire netting. At any rate, the railroad companies of the United States have settled down to the use of wire netting as the most efficient and serviceable material for spark-arresting screens to be used in smoke-boxes of locomotives. Mr. Kearney, one of the appellees, and now an employee of the Pennsylvania Railroad, himself testifies that upon that road wire netting is in use for this purpose (p. 226).

It is therefore respectfully submitted that the court below estimated the gains and profits accruing to the appellant upon a basis not warranted by the rule of law established by this court, and that, even if the Kearney and Tronson patent is held to be valid and the appellant an infringer, the decision of the court below should be overruled upon this point; but it is also submitted that the appellees' patent is invalid, and that, if valid, the appellant has not infringed the same.

CHARLES E. MITCHELL,
ROBERT J. FISHER,
Counsel for Appellant.

It is therefore respectfully submitted that the court below estimated the gains and profits accruing to the appellant upon a basis not warranted by the rule of law established by this court, and that, even if the Kearney and Tronson patent is held to be valid and the appellant an infringer, the decision of the court below should be overruled upon this point; but it is also submitted that the appellees' patent is invalid, and that, if valid, the appellant has not infringed the same.

CHARLES E. MITCHELL,
ROBERT J. FISHER,
Counsel for Appellant.

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158-461

United States Supreme Court

OCTOBER TERM, 1894

THE LEHIGH VALLEY RAILROAD COMPANY,
Appellant,

and

FRANCIS KEARNEY and MARY F. TRONSON,
Executrix, Etc., Appellees.

No. 314.

On Appeal from Decree of United States Circuit Court, District of New Jersey.

BRIEF FOR APPELLEES

ELWOOD C. HARRIS,
Counsel for Appellees.

Advertiser Printing House, Newark, N. J.

United States Supreme Court.

October Term, 1894. No. 314.

THE LEHIGH VALLEY RAILROAD COMPANY, *Appellant,* *and* FRANCIS KEARNEY AND MARY F. TRONSON, Executrix, &c., *Appellees.*	*On Appeal from Decree of U. S. Circuit Court District of New Jersey.*

BRIEF FOR APPELLEES.

Statement.

This is an appeal from a final decree of the Circuit Court of the United States for the District of New Jersey, adjudging that the appellant do pay to the appellees the sum of six thousand two hundred and thirty-five dollars and fifty cents, for infringement of patent of the appellees. (Rec. p. 2 and p. 306.)

The bill was filed in the Circuit Court on March 15, 1883, by the appellees, the complainants against the appellant, the defendant, a corporation formed under the laws of the State of Pennsylvania, to enjoin the defendants from infringing the patent of the complainants, and to pay the profits acquired by the defendant from the use of the complainants' invention and the damages suffered by the complainants from such use. (Rec. p. 3 and p. 5.)

The defendant interposed a plea that the complainants were not the sole owners of the patent (Rec. pp. 6 and 7), and after taking evidence the plea was overruled. (Opinion of Judge Nixon, pp. 28–30; Order p. 30.)

The defendant answered the bill of complaint, attacking the validity of the complainants' patent, and denying infringement thereof (Rec. pp. 31–33), and after taking evidence, the cause was heard by Mr. Justice Bradley, sitting in the Circuit Court for the District of New Jersey, and the patent was sustained and the defendant held guilty of infringement, and an accounting ordered. (Opinion Rec. pp. 142–146, Decree p. 146.)

Upon the accounting the Master first reported $471.60 (Rec. pp. 270 and 271), and upon exceptions of the complainants Mr. Justice Bradley sustained the exceptions, and directed the Master to allow by way of profits realized by the defendant, the difference between cost of Diamond Stack arrester, and the infringing device. (Rec. pp. 272–273.)

The Master having further reported profits realized by the defendant to the amount of $4,628.72 (Rec. pp. 298–301), upon exceptions by both parties, Justice Bradley increased the amount to $6,235.52 (Rec. p. 303–305), for which amount decree was entered against the defendant. (Rec. pp. 305–306).

FIRST POINT.

The evidence in the cause is not sufficient to support the defendant's plea that the complainants were not the sole owners of the patent at the commencement of the suit.

The testimony adduced by the defendant shows that it relies on defendant's Exhibit No. 1, called Kearney & Tronson's acknowledgment of joint ownership and Title (Rec. p. 12), of which Exhibit the following is a copy :

"To whom it may concern :

"This certifies that John H. Immen is fully authorized and "empowered to make any contract with the Central Railroad of "New Jersey, that may be binding on our part, for the sale of "the patent right on Spark Arrester as secured to us by letters "patent No. 113,528, dated April 11th, 1871, and re-issue No. "5,184, dated December 10th, 1872, he having one-third equal "interest with ourselves in the said patent.

"F. KEARNEY,
"LUKE F. TRONSON.

"Newark, April 10th, 1873."

Before discussing the legal effect of this paper it will be well to examine what the situation of the parties was at the time and previous thereto, and what the relation of the parties to the suit is.

The patent bears date April 11th, 1871. On April 5th, 1872, an agreement was entered into between Francis Kearney and Luke F. Tronson (then living), the patentees of the one part, and John H. Immen of the second part (Record pp. 18 and 19), and thereby Immen was constituted the *agent* of the patentees for the sale and introduction into use of the Spark Arrester on the railroads of the United States for *one year*—Immen to receive 25 per cent. of amount received for sales, and Kearney and Tronson 75 per cent., and that said Kearney & Tronson should not be liable to him for any sum of money for services, charges, expenses or otherwise under the agreement or *otherwise.*

They also agreed to appoint no other agent if the said Immen should proceed in good faith to introduce the improvement.

During this year and on December 10, 1872, a re-issue of the patent was secured.

Kearney testifies that Immen, in consideration of being allowed one-third instead of one-fourth of what he might sell, paid the office fee of $20 in Washington for the re-issue. (Rec. p. 22.)

Five days after the expiration of the year which the first agreement covered, the above paper was executed.

Kearney testifies (Rec. p 21) that it is in Immen's handwriting, that Immen came to see him on Broad street, Newark, where he was at work, and (Rec. p. 22) took the paper from his satchel, and said he expected to go and see the Central Railroad people on that day, as they had told him they were about ready to settle with him for the use of the Spark Arrester, and he had brought the paper for Kearney & Tronson to sign, that the Railroad Company might see that he had authority to settle with them. When he came to part about having one-third interest he remarked that this paper was merely to show he had the right to settle.

He denies that Immen became the owner of one-third the patent, or that there was ever any agreement that he should become the owner of one-third thereof. (Rec. pp. 23 and 25).

This paper Immen recorded in the Patent Office, July 2, 1873.

The defendant has put in evidence on assignment from John H. Immen to William G. Annan dated April 28, 1874, and recorded April 30th, 1874. (Rec. pp. 12 and 13).

Also a re-assignment from Wm. G. Annan to Immen, dated June 22, 1875, and recorded May 16, 1883. Rec. p. 13).

The bill of complaint in this cause was filed March 15th, 1883, by Francis Kearney and Mary F. Tronson, executrix of the last will of Luke F. Tronson, deceased, claiming to be the sole and exclusive owners of said patent. (Rec. p. 3).

After the commencement of this suit and notification to the defendants and on May 10th, 1883, the said John H. Immen assigns his right, title and interest to the defendant, and there is added a special release and discharge to the Lehigh Valley Railroad Company and all corporations, officers and employees who were then operating or theretofore had operated said Railroad, its branches and all lines of road leased or operated under its control, from all claims, etc., for infringement of said letters patent. (Rec p. 17 and p. 19.)

Consequently, the defendant, The Lehigh Valley Railroad Company, has taken this assignment with full knowledge of the fact that at and before that time the complainants claimed to be the sole and exclusive owners thereof, and thus being purchasers with notice, they can make no better claim than Immen could.

Also, having acquired everything which Immen had, including a discharge from liability to him for all past infringements, so far as he might have any claim, all parties interested are parties to the present contest and all rights may be determined on this issue.

The defendant therefore having been brought before this Court to answer a charge of infringement to the complainants' patent, in its search to ascertain how it may evade the charge, discovers Immen with this paper, buys him out, tries to cover up his infringement by a clause of release for itself and all the roads it operates, and interposes the plea now before the Court.

Does the evidence sustain the plea? The language of the act of Congress Sec. 4,898 is: "Every patent or any interest therein "shall be assignable in law by an instrument in writing; and the "patentee or his assigns or legal representatives, may, in like "manner, grant and convey an exclusive right under his patent "to the whole or any specified part of the United States. An "assignment, grant, or conveyance shall be void as against any "subsequent purchaser or mortgagee for a valuable consideration, "without notice, unless it is recorded in the Patent Office within "three months from the date thereof."

The paper signed by Kearney & Tronson does not purport to be an assignment, but an authorization to Immen to act for Kearney & Tronson in the sale of the Patent Right; not generally, but to a particular party, The Central Railroad of New Jersey.

It contains no such word as *assign*, *grant*, *convey*, *tranfer* or *set over*. There are no active words, in the paper for this purpose.

In Curtis on Patents 4th Ed. Sec. 103, the author uses these words with reference to assignment :

"As we have seen, in order to constitute an assignment, there "must be a grant, which vests in the grantee, etc."

In previous sections (179 and 180) the same author speaks of the ownership of a patent as a legal estate vested, and the transfer of it as *conveying*.

The alleged assignment is without consideration, and while a consideration is not necessary, under the act, the fact that none is expressed, I think confirms the complainants' insistment that they did not thereby assign a one-third interest.

The whole legal effect of the last clause of the paper, I take it, is that of a *recital* in an instrument made for another purpose and the question any one would ask, upon reading this clause would be, where is the assignment to Immen of the one-third interest which this paper says he owns ?

A *recital* in an instrument may be qualified or contradicted by extrinsic evidence if the law of estoppel does not prevent.

2 Parsons on Contracts, 554
Greenleaf on Evidence, Sec. 285.

The law of estoppel applicable to the case before us is clearly laid down in Den *vs.* Baldwin 1 Zab. 403.

"This equitable estoppel rests upon the principle that when anyone has done an act or made a statement, which it would be fraud on his part to controvert or impair, and such act or statement has so influenced any one that it has been acted upon, the party making it will be estopped, and cut off from the power of retraction. It must appear, first, that he has done some act or made some admission, inconsistent with his claim; secondly, that the other party has acted upon such conduct or admission; and thirdly, that such party will be injured by allowing such conduct or admission to be witndrawn."

In 2 Parsons on contracts 593, note Q and 795 note R many cases are cited, and they bear out the doctrine that where there is knowledge of the real state of affairs, the reason and rule of applying the doctrine of estoppel cease.

As stated above, the Railroad Company took an assignment from Immen with full knowledge that the complainants claimed to be the sole owners of the patent, and Mr. Kearney denies that Immen was the owner of any interest therein—and the defendant has failed to support his plea in any way except by the paper in question.

The paper on its face, when used to support an asssignment of one-third the patent, looks like a fraud.

John H. Immen knew enough about patents to ask a formal assignment if he was entitled to one.

When he decided to put the title in the name of Annan (Rec. p. 12 and 13) he executed an instrument with a consideration stated, by which he *assigned, sold,* and *set over,* and when Annan reassigned it, he observed the same formalities.

SECOND POINT.

The complainant's patent is a valid one, and the re-issue thereof a proper re-issue.

The original patent was granted April 11, 1871—and numbered 113,528 (Rec. p. 127) for improvements in Spark arresters on locomotives.

It is described as placed in the smokehead of a locomotive and is a "grate, the peculiar features of which are its perpendicular "bars with fixed apertures sufficiently fine to stop the sparks "that come from the fire, the size of the grate being determined "by the area of opening needed for the regular draught and escape "of smoke on kindling the fire or when the engine is not in motion.

"Upon the top of the grating a tube or pipe is fitted, extending "upward a short distance above the top of the smokehead into "the chimney. A space is left around the top of the pipe between "the edges of the aperture in the top of the smokehead and "pipe. This space is covered with netting or grating to prevent "sparks or coals from passing through into the chimney."

* * * * * "We disclaim all draught regulating contrivances and also all gratings with lateral adjustable, openings."

The claim of the patent was "The grate D with logitudinal "bars as and for the purposes specified and shown."

In the re-issue (Rec. p. 129) the netting or grating placed around the top of the petticoat pipe is simply described as necessary to cover the difference in size between the opening and the pipe that enters it. There is added in the description: "H is "a piece of boiler plate or sheet iron placed at the bottom of "the smoke box in order to provide a flat surface for the grate D "to rest upon, etc."

The remaining description of the invention and its application to a locomotive are substantially the same—and the first claim in the re-issue is "The grating D with vertical bars placed at the "foot of the spark or petticoat pipe, E, in the manner and for "the purpose substantially as described."

It is to be noted that the drawing is the same in both the patent and the re-issue and shows clearly the invention and its application, and adds no new matter to what was clearly described or implied in the original patent.

The complainants' invention as claimed in their patent, is not anticipated by other inventions.

The defendant in its answer, alleges that the complanants' invention or all substantial or material parts thereof were shown or described in letters patent of the United States previously granted and seven patents are named, and the same were put in evidence. The first one named in the answer is evidently intended to be the patent of William W. Hubbell instead of Leonard Phleger. See Record p. 108, the No. and date corresponding.

Before examining these patents, it is proper to say that the complainants do not claim to be the first to place a screen in the smoke head to stop the escape of sparks or coals, but they do claim to be the first inventors of a practical grate for that purpose. Under the point of the defendant's infringement of the complainants' patent, that matter will be further considered.

The first put in evidence, W. W. Hubbell, No. 2143, June 26, 1841 (Rec. p. 108), is an old one and shows a complex contrivance placed above the boiler with a perforated metal or wire gauze to stop the coals, with an inclined plane for the coals to pass out into a spark box.

The second patent, E. May, July 28, 1857 (Rec. p. 111), is also a wire gauze or perforated plate placed in the smoke head of the locomotive through which the smoke must pass.

The third patent, J. L. Vauclain, August 20, 1861 (Rec. p. 113), is a draft-regulating device, which includes a perforated screen with horizontal openings as shown in the drawing and described as latitudinal openings.

The fourth patent, Weidman, Major & Sample, December 20, 1870 (Rec. p. 115), is a perforated plate as a screen.

The fifth patent, A. S. Sweet, Jr., June 23, 1863 (Rec. p. 118), is a wire gauze screen.

The sixth patent, James Smith, August 16, 1870 (Rec. p. 122), is also a perforated screen.

The seventh patent, James Smith, March 7, 1871 (Rec. p. 125), consists of an inner perforated tube or grating surrounded with an outer tube with openings at the top and bottom; this outer tube being evidently for the purpose of directing the escaping steam from the exhaust tubes upward into the smoke stack to create a draught. The patentee says of the inner perforated tube: "This may be made by a continuous bar of wrought iron coiled "spirally as shown, or it may be composed of a number of cast "iron rings strung to thin rods as shown in Fig. 4; or the grating "may be made in any other desired manner, provided it presents "rigid bars for the hard ignited cinders to strike against and pro-"vided there are openings sufficient in number and size to permit "the free escape of lighter particles with the products of com-"bustion."

Thus it will be seen that none of the patents referred to describe or suggest a grate of vertical iron bars placed at the foot of the spark or petticoat pipe. This spark pipe was in common use in locomotives to direct the escaping steam up into the smoke stack, thus causing a draught through the boiler flues. The last patent while describing a grating of rigid bars, the same are constructed horizontally and not vertically. This is the only patent that suggests such a grating to stop the coals, and if it be urged that in the words "or the grating may be made in any other desired manner," &c., it is the same as the complainants' invention, yet it does not appear that the invention is prior to the complainants' invention.

The Smith patent was issued and bears date March 7, 1871, and the patent of the complainants was issued April 11, 1871. The complainants have put in evidence the file wrapper, from which it appears that their application was sworn to December 31st, 1870 (Rec. p. 96), and filed January 5, 1871. The application was examined and on February 4, 1871, rejected (Rec. p. 96); after amendments and correspondence between the Patent Office and the inventors (Rec. pp. 96 to 99) the patent was issued April 11, 1871. The defendant has not in any way shown the date of the application of the Smith patent. It is evident that the complainants' patent would have been issued early in February had not the amendments been found necessary. Under this evidence the complainants' invention is shown to have been prior to the Smith patent, and the latter patent cannot be held to be a prior invention.

THIRD POINT.

The defendants are guilty of infringing the complainant's patent.

The complainants insist that the defendant has infringed the first claim of the re-issued patent, which is as follows: "1. The "grating D with vertical bars placed at the foot of spark or "petticoat pipe E, in the manner and for the purpose substan-"tially as described." (Rec. p. 130.).

The specification relating to the parts mentioned in said claim is as follows: "E is a pipe extending from within the base of the "smoke stack down into the smoke box, and commonly termed a "petticoat pipe. D is a grating placed at the lower part of the "petticoat pipe to prevent any cinders or sparks passing into the "same." (Rec. p. 129.)

"We construct the grating D with straight vertical bars of iron "placed at small distances apart, but these spaces should be such "in the aggregate as will be sufficient for the draft and escape of "the smoke, on kindling the fire or when the engine is not in "motion." (Rec. p. 130).

There is no dispute as to the exact form of grate which the defendant has used in a number of locomotives for about four years just preceding the filing of complainants' bill nor the manner of its application to a locomotive.

Defendant's exhibits A and B (Rec. 4th and 5th exhibits following p. 307) illustrate the matter, while "Complainants' Exhibit Defendant's Grating" is a piece of the grating used by the defendant.

A grating made of straight vertical bars of iron placed at small distances apart so as to allow smoke to pass, and to arrest sparks or coals, must have narrow vertical slots; such a grating is shown both in the drawing of the patent and the re-issue and in exhibit 5 for complainants.

Webster defines Bar as follows: "A piece of wood, metal, or other solid matter, long in proportion to its diameter or width, used for various purposes, but especially for a hindrance or obstruction."

Hence I take the specification in the patent applies to a grating in which the metal separating the opening is longer than it is wide, and in its length vertical.

The expert called by the defendant, Mr. Henry L. Brevoort, in his direct examination (Rec. p. 81) seems to think that the expression "straight bars" refers to independent bars of iron in some way to be fastened and held in place, but on his cross-examination (Rec. p. 83) he admits there is nothing in the description or drawing of complainants' patent to exclude a cast grating like exhibit 5, that has bars of iron, but the witness does not think they are the bars of iron the patentees meant.

After this explanation, I think it is entirely clear that all the substantial features of the complainants' invention as to the grate are contained in the grate used by the defendant. The metal forming the grate constitute vertical bars not indeed so long as shown in complainant's drawing, yet surrounding a vertical slot 3-16 of an inch wide and from 3 to 3½ inches long.

Mr. Oliver Drake, the expert witness called on behalf of complainants, considers the grating of the defendant in its operation and effect the same as complainants' patent.

Mr. Brevoort thinks that the grating shown in the Blue Print is not an infringement of the complainants' grating for such reasons as these. (See Rec. p. 79.)

In complainants'—grating of vertical bars.

In defendant's—grating of vertical slots.

In complainants'—longer than in defendants; series of vertical bars.

In defendant's—a single casting, etc.

It seems to me that a mere inspection of the two grates must convince any one that the making of the grate with longer or shorter slots, with joints broken at the same place or alternately, is immaterial, so long as the slots are longer than their width and the openings are vertical.

As to the application of this grate, the complainants' specification as I have above quoted shows that their grating is placed at the bottom of "a pipe extending from within the base of the smoke stack down into the smoke box," and, they add, "commonly termed a *petticoat pipe*."

In this first claim above quoted, they call it a *spark* or *petticoat pipe*.

In their specification they also say "F is a netting or grating "placed around the top of the petticoat pipe so as to cover the "annular opening caused by the difference in size of the upper "part of the petticoat pipe and the bottom of the smoke stack G."

The counsel for the defendant, in his examination of witnesses, has seemed to lay great stress on the fact that the defendant in its use of a grating did not use what is commonly called a petticoat pipe, but a pipe which was either a downward extension of the smoke stack itself or a pipe which filled the entire opening of the bottom of the smoke stack.

It will be noted that the complainants describe this pipe as extending down into the smoke arch or head from within the base of the smoke stack and whether it fills the whole base or less it is a pipe leading up to, and into the smoke stack.

The purpose of such a pipe, however constructed, or whatever it be called, is the same, namely, to create a draft.

The exhaust nozzles open into its lower end and this pipe directs the escape of steam up to, and into the smoke stack while the engine is steaming, and a powerful draught is thereby created.

Mr. Drake (Rec. p. 53) says that both are practically a downward extension of the smoke stack, and on pages 54 and 55 the same witness says the inventors used the term petticoat pipe as engines were at that time usually constructed with such a pipe and by their descriptions applied their invention to the same.

John L. Kinsey, a master mechanic in the employ of the defendant (Rec. p. 65) defines the petticoat pipe as one that goes down near the bottom of the smoke arch for the purpose of lifting any dirt or matter that may be in the bottom of the smoke arch to create a draught in connection with the exhaust pipes of the engine, and on page 66 he says of the use of the grating by the defendant, the smoke stack is extended down into the smoke arch a foot or eighteen inches and the spark arrester attached to it at the bottom and the escape of steam, smoke, etc., in such a construction is by entering the extended smoke stack at its base.

Henry L. Brevoort, the defendant's expert (Rec. p. 80) says, Now, I am fully aware of the fact that this downward extension of the stack performs one of the functions of a petticoat pipe, that is, the blast from the exhaust nozzles is conducted upward by this downward extension and thrown into the stack, but the clear function of creating a draft from the smoke box into the stack around the exterior of the upper end of the petticoat pipe, which is an essential feature of a petticoat pipe, is not present in defendant's structure, &c.

W. H. Lewis, called by the defendant, and master mechanic of the Delaware, Lackawanna and Western Railroad, testifies (Rec. pp. 90 and 91) that unless the exhaust nozzles extend to within eight or nine inches of the top of the smoke arch it is necessary to use either a petticoat pipe, or an extension of the smoke stack downward to guide the steam into the smoke stack so as to make a draught through the tubes and that such an extension of the stack downward and a petticoat pipe are substantially for the same purpose.

It is further to be noted that no point is made in the description of complainants' invention and its application as to the relative openings about the top of the petticoat pipe and at the bottom, and the opening at the top is only mentioned as caused by the difference in size between the top of the pipe and the bottom of the smoke stack. If they were the same size or fitted closely, the one unto the other, no upper netting would be required. This upper netting and difference in size is in no way a necessary part of the claim in complainants' patent.

FOURTH POINT.

Answer to the defendant's allegation of want of utility in the complainants' patent

We might almost dismiss this point with the question: "Then why did you use it?"

Much of the testimony of the defendant has been to attempt to prove that the complainants' grate does not answer the purpose intended as well as some other grates, that its vertical openings are more apt to clog.

Three photographs are introduced, said to have been taken after a like run of the locomotive, each with a different spark arrester.

It is to be noted that the views are from the front end of a locomotive, the side of the grate away from the flues.

The grating in Exhibit B, which it is claimed is an infringement, had been in the engine from at least January 26, 1882, to the Spring of 1883, and was not newly put in for the experiment as the other gratings were. (Rec. pp. 70 and 71.)

The photograph shows the side of the grate on which knobs were cast at each end of the slots. The piece of grating which Mr. Kinsey produced has no knobs. A close inspection of this photograph will show that more cinders are lodged in the lower end of the slots, resting on these knobs, than in the upper end, thus contradicting the theory of defendant's witnesses, or some of them, that the coals carried upward by the draught become wedged in the upper end of the vertical slots. These knobs, I think, act in two ways against the full usefulness of the grate. The draughts being upward, the course of the smoke and such small cinders as will pass through, will be obliquely and a coal too large to pass through but having the smaller part in the slot will slide upward and the projecting knob will be a shelf to stop the upward motion of the cinder. The knob also prevents the oblique current from entering at the lower end of the slot. Mr. Brevoort (Rec. p. 84) says the knob or lug will tend to shorten the slot.

In regard to the experiments testified to, it appears that the defendant did not think it necessary to make them until the complainants' suit was begun, and that for four years or more prior to 1883 the defendant had the grates on a large number of locomotives.

In addition to the testimony of Mr. Kearney, one of the complainants, of the usefulness of the complainants' grate, the testimony of three locomotive engineers, who had used this grate for some length of time, entirely contradicts the evidence of some of the defendant's witnesses of the liability of a vertical slot to clog.

Oscar Durand, an engineer of thirty years' experience, of the New Jersey Central Railroad, testifies in rebuttal testimony (Rec. p. 132) that he had run an engine with complainants' grate; that it worked well, did not clog, not necessary to clear slots, never prevented making steam, and, on page 134, that he had not done as good work with any spark arrester previous to using Kearney & Tronson's.

Thomas Malay, engineer for eighteen years (Rec. p. 135) ran a locomotive with the K. & T. arrester, was never troubled in making steam by reason of clogging, never necessary to remove cinders by reason of their sticking in the slots. This engineer was on the D., L. & W. R. R., and the arrester remained in use until Lewis, who filled the place of Tronson as Master Mechanic, who was discharged, took it out.

George S. Force (R. p. 137), who ran an engine on the D., L. & W. R. R. for fourteen years previous to 1879, says he ran the engine Pohatcong two or three years with the K. & T. arrester, that he had no trouble from coals lodging in slots, never necessary to clear the slots. He also testifies to the fact that it did arrest the sparks and kept them in the smoke head. The arrester in his engine was also taken out by Lewis.

But the most complete answer to the defendant's allegation of want of utility in the complainants' patent is in the way the defendant came to use the infringing device and the extent to which it was used, which will be given in the next point of my brief on the question of damages.

FIFTH POINT.

The defendant realized a large profit in the use of the infringing device, and the decree of the Circuit Court is correct in awarding the same to the complainants.

In the evidence of John L. Kinsey, Master Mechanic of the defendant at the South Easton shops (Rec. p. 160) it appears that the company first put in the grating complained of in December, 1878, in one engine, and the number of engines equipped with this arrester in each year was as follows:

1878, in December	1
1879	64
1880	17
1881	14
1882	17
1883, to March, when suit brought	15
Total in use when suit brought	128

From the evidence of H. Stanley Goodwin, General Superintendent of the road (Rec. p. 153), it appears that the arresters with vertical slots were only used on the engines belonging to South Easton, and the number of engines in use November 30th of said years was as follows:

In 1878	100
" 1879	100
" 1880	103
" 1881	109
" 1882	124
" 1883	133

Thus it will be seen that by the end of 1879, and within about a year after commencing to use complainants' spark arrester, they had placed it on two-thirds of the locomotives then in use, and that the proportion of spark arresters put in in the subsequent years was greater than the number of locomotives added, so that in March, 1883, when this suit was commenced, the same was in 128 locomotives—substantially all the locomotives then in use, because November 30, 1882, there were but 124 locomotives in use, and in November, 1883, only 133.

Mr. Kinsey testifies (Rec. p. 163) that down to 1877 the diamond stack cone and netting was in general use by the defendant, and a drawing has been put in evidence by the defendant, which is the third drawing from the end of the record. The same stack substantially is shown to have been the Standard Smoke Stack on the Pennsylvania Railroad at Altoona April 23, 1879 (see last drawing in the record), and that in 1877 he commenced putting wire screens in the smoke arch and straight stacks upon some of the locomotives; but (Rec. pp. 167, 168) he can give no estimate of the number put in, but there were locomotives changed from the diamond stack cone and netting to the straight stack with vertical grates. On page 162 he says: "We didn't have to renew them, because we hadn't them long enough to wear out." On page 168 he testifies that the cost of the wire netting, exhibit D, was $5.49, and of exhibit B, the infringing device, $2.87, and produces itemized cost of each (Rec. p. 307), thus showing that in the cost of applying the two devices the infringing device was $2.62 cheaper, and he says this was the reason it was used.

On page 171 Mr. Kinsey states that he cannot tell as to the comparative durability of cast grates and wire screens, because they did not use the wire screen long enough, but in his judgment the wire screen would last twice as long.

If this were all the testimony of Mr. Kinsey in the matter it might seem as if the only reason why the defendant used the infringing device instead of wire screens from 1878 and 1879 to the commencement of this suit was the small difference in the cost of applying the two devices; but in his subsequent testimony Mr. Kinsey has cleared this matter up so that without difficulty we can see that it was not the difference in cost at all that led the defendants to use the infringing device instead of a wire screen, but because the wire screen did not work. The full testimony will make this point clear.

PAGE 266.

Q. You put in and used some wire screens in the smokestack in 1877?

A. Yes, sir.

Q. And you took them out and replaced them with vertical screens?

A. Yes, sir.

Q. Why?

A. Because it would be cheaper.

Q. After you had them made.

A. Yes, sir, it would be cheaper.

Q. After you had had them made?

A. Yes, sir.

Q. But you took them out after you had put them in?

A Well, we put them in and then we substituted a cast iron grating, but I do not recollect whether they were worn or not.

Q. Then you used wire screens in quite a number of engines in 1887.

PAGE 267.

A. Yes, sir.

Q. Long enough to test it and find its advantages?

A. Yes, sir.

Q. Well you threw it aside and used cast iron screens?

A. Yes, sir.

Q. Until suit was brought?

A. Yes, sir.

PAGE 268 MIDDLE.

Q. After you took out the wire screens in 1877 and replaced them with these cast gratings did you set fire to buildings or anything that called the attention of the company to the fact that they were not a proper arrester?

A. Yes, sir.

Q. *But still you kept them in?*

A. *Well, we put in the horizontal.*

Q. But not until after five years?

A. After we found out what was the next best thing we took the netting (—interrupted)

Q. You used netting in 1877?

A. Partially.

Q. And on engines of the same form?

A. Yes, sir.

Q. And took those out and put in gratings with vertical slots?

A. Yes, sir.

Q. You introduced this from year to year?

A. Yes, sir.

Q. And had them on all your locomotives substantially when this suit was brought?

A. Yes, sir.

Q. After that you had no difficulty from fires?

A. We had fires the same as other railroads have them, after we put the wire netting in we found that it retained the coals in the smoke box and the grating pulverized it and allowed it to pass through.

Q. (By Mr. McCallum.) What was the old mesh?

Page 267.

A. Quarter inch.

Q. (Re-Cross) Could you not have made the mesh nearer in this casting?

A. No, sir, the sand would not stay in the place, the ones used were quarter inch mesh.

Q. Well, you used from 1878 to 1886 continuously cast screen with this mesh.

A. Yes, sir. The openings in the mesh of complainants' ex. Defendant's Grating are a little smaller than the ones we first used.

Q. Did you have so much trouble from fire that you sought to change your mesh?

A. Yes, sir. The wire netting was too large in the mesh, the wire we used in 1877.

Q *Why did you not put in a wire with a smaller mesh?*

A. *Because we thought we could not make steam.*

Q. *And so you continued to use these during this time as the most effective arrester you could use?*

A. *Yes, sir, until we found out that this was better.*

Q. *You found that out afterwards?*

A. *Yes sir.*

Q. *Then the cause was simply that casting was better than netting?*

A. No, sir, but the iron could be put in easier than the netting could, but the way in which we put it in now, in two pieces with angle irons is very simple and makes it easier to put in and take out.

Q. And besides the wire you used then was too large in the mesh and did not stop the coals?

A. Yes, sir.

Q. *Then it would seem that so far as the wire netting in* 1877 *you considered it a failure?*

A. So far as the mesh was concerned.

This testimony thus makes the matter perfectly clear why, in 1877 and 1878, *after going to the expense of fitting wire netting into a number of locomotives the same was taken out and the infringing device used*, so that it was not a question of expense at all that led the defendant to use the infringing device, but because the wire netting did not work. Mr. Kinsey's testimony notwithstanding his evidently earnest desire to shield his company from the effect of this infringement puts out of the case the theory he has undertaken to establish, that it was only a question of expense in applying netting or cast screens; it was nothing of the kind. The cast screens answered the purpose, the netting did not. It was pulled out of the locomotives in which it had been placed and cast screens substituted. It was a failure, The cast screens were a success. So that in ascertaining the profit gained by the defendant in the use of the complainants' patent it is not a comparison with wire screens used in the same position as the complainants' screen, but either a comparison of the complainants' patent with the diamond stack, cone and netting as a spark arresting device, taking into account the cost of applying the latter device, the frequent repairing and replacing of its parts, their liability to become defective while the engine is doing its work and the damage by fire consequent thereon or the comparison between the complainants' spark arrester as used by the defendant, and the wire screen as afterwards applied by them with the consequent expense of a spark box and all its attachments. (See Spark Box drawing the third following the photographs.)

In addition to this testimony of Mr. Kinsey in pulling out the wire nettings put in in 1877 and '78 the testimony of Reuben VanHorn, an employee of the defendant at their Round House in Perth Amboy shows (page 176), that hot coals are constantly drawn from the furnace through the flues into the smoke arch and these coals, if there is any imperfection in the joints of the smoke arch or the front door of the locomotive so as to admit air will furiously burn. Other witnesses testify to the same fact and that about the time the company commenced using wire screens in 1886 the spark box was put on to draw the coals from the smoke arch. The constant heating of the wire netting, being wrought iron, would soon eat it away—the surface disintegrating.

The defendants have sought to controvert this proof by two experiments. First (p. 261) they have produced before the Master a piece of wire netting and a piece of cast grating which had been placed in a furnace until they were brought almost to the melting point, and shows that the cast grating melted at a less heat than the wire netting.

Upon cross-examination, on pages 265 and 266, Mr. Kinsey says with reference to this experiment, that in heating iron it will become red a good while before it would melt, meaning at a much less heat, while the result of constantly heating wrought iron will be that it will scale off; and also he testifies with reference to the common use of cast iron for furnaces, stoves, etc., where the coals come in contact with the iron without burning, and that there is no question in his mind but that cast iron will stand the heat of red hot coals better than wrought iron.

Another experiment brought by Mr. Kinsey to the attention of the Master was a locomotive in which wire screen had been used for a couple of years without a spark box; this engine was No. 31, and when we come to cross examine Mr. Kinsey we find on page 268 that No. 31 is only a switch engine used in the yard, by the following testimony :

Q. Does 31 switch around the yard ?

A. Yes, sir.

Q. And that is easier than working on the road ?

A. Yes, sir; if she was working along the road she would have to be cleaned out.

And from this answer it is at once apparent that a switch engine puffing for a few minutes and then shutting off the draft is no test of the use of a wire screen without a spark box when compared with a locomotive drawing a heavy train of cars and steaming constantly hour after hour.

Francis Kearney (pp. 226 and 227) testifies to the hot coals that are drawn through the flues and which burn in the smoke arch of the locomotives of the Penn. Railroad and that if these coals reach the wire netting they will burn it out, and that he has seen the netting thus burned out. This must be taken as true, and that the defendants could not deny this fact, for they have produced no evidence from the officers or employees of the Penn. R. R. to disprove it.

And further still, speaking of these experiments, notwithstanding the fact that Mr. Kinsey before the exhibition of locomotive No. 31 had declared that they kept the front end of the locomotive tight so that the coals could not burn in the smoke arch, it appears on pages 262 and 263 from the testimony of George Moir, the engineer in charge of engine No. 191, also exhibited, that on the run made that day with the spark box closed the coals which collected in the front end of the locomotive had heated all the lower part of the smoke arch so that the paint had all burned off since morning.

The testimony of Mr. Kinsey, notwithstanding his denial of the fact, proves, I think, that the company have found it necessary to construct an expensive spark box in connection with the use of wire netting, and that they could not use the wire netting without it.

In 1883, when the complainants began their suit, the company substituted a cast grating with horizontal slots, and continued to use this grating until the Spring of 1886, at which time, by reason of the Pennsylvania Railroad requiring the company to use netting, they discarded the cast gratings entirely (Rec. p. 173), and the date is given as April 20, 1886, up to which time the cast screens had entirely been used. On page 260 Mr. Kinsey desires to make it appear that wire netting was used for several years without a spark box, as follows :

Q. When you discarded the cast metal gratings and went back to the netting did you use the netting without a spark arrester box in front and beneath?

A. Yes, sir.

Q. For how long?

A. For several years. We have some of them yet.

Then follows some testimony with reference to engine No. 31, a yard switch engine, and the only engine shown to have used the wire screen any length of time without the spark box.

Under cross-examination Mr. Kinsey tells a different story, on page 267 :

Q. Who devised the spark box that is now on your locomotives?

A. Mr. Mitchell has a patent on the spark box that is on this engine that I have fitted.

Q. And they were put in first how long ago?

A. I think during 1886 some time, to the best of my knowledge.

Q. Did you ever use them in connection with a cast iron grating?

A. No, sir.

Q. You have since fitted them to about all your locomotives, have you not ?

A. Very nearly.

AND AT BOTTOM PAGE 267.

Q. And then in 1886 commenced putting on wire netting?

A. Yes, sir.

PAGE 268.

Q. And some time in the same year you commenced using the spark boxes?

A. Yes, sir.

Q. Why did you not use spark boxes before with this cast grating ?

A. Because the dirt and stuff would go out in small particles, so that we did not need any spark box. After we put in the netting we had to put in a box to take care of them.

Thus it will be seen that when we get at the whole truth in Mr. Kinsey's testimony it appears that for about eight years the company used cast gratings—first vertical until suit brought, then the horizontal without any spark box—but that as soon as wire netting screens are introduced, the same year, spark boxes are found necessary and are put in.

With these facts testified to; *with the use of wire screens in* 1877 ***without spark boxes, and taking them out almost immediately and not touching them again for eight years ; with the introduction of spark boxes in*** 1886, *as soon as the company were compelled by the P. R. R. to use wire netting, it is **perfectly clear that it was** not a question of difference on cost between* **$5.49** *and* **$2.87**, ***but with*** **$90** *to* **$100** *added to* $5.49, the cost of attaching spark boxes to each locomotive, as shown by the evidence of John Gomer, page 210, and of Osceola Currier, page 223.

In the testimony in this cause the defendant has sought to show that a screen with horizontal openings, adopted by the company in 1883 after this suit was begun, was a better arrester than the one with vertical openings, and I presume it will be urged that the defendants might have used that screen, which could be as cheaply applied as the infringing device.

There are two answers to such a claim :

First—Such a screen was not in use at the time the defendants adopted the infringing device.

Second—Such a screen was covered by the patent of James Smith of March 7, 1871, No. 112,506, and could not be used by the defendants.

The question in this cause is:

What profits did the defendants derive from using the complainants' invention over that they had in using other arresters then open to the public and adequate to enable them to obtain an equal beneficial result? The fruits of that advantage are their profits, and that advantage is the measure of profits to be accounted for.

> *Mowry* v. *Whitney*, 14 *Wallace*, 620.
> *Black* v. *Thome*, 111 *U. S.*, 122.
> *Corporation of N. Y.* v. *Ranson*, 23 *Howard*, 487.

The solution of the present question is not to be found in theory, but in fact.

What was in general use by the company as a spark arrester just previous to adopting the infringing device, and what profit did the defendant gain by the change, must be the basis of estimating the advantage. *It must be presumed that they used the appliance in common use best adapted to their purpose just previous to using the infringing device, unless they by their evidence prove otherwise.*

The spark arresting device in general use by the defendants in 1870, and down to the time of the change to the infringing device (except a few wire nettings put in in 1877 and 1878, which, as we have shown, proved failures), was the diamond stack cone and netting.

Mr. Kinsey's statement and testimony show locomotives equipped with the infringing device as follows:

65	put on as	early as	1879,	taken	out 1883,	used	4	years.
17	"	"	1880,	"	"	"	3	"
14	"	"	1881,	"	"	"	2	"
17	"	"	1882,	"	"	"	1	"
15	"	"	1883,	"	"	"	2	mos.

Total, 128 locomotives used it an average time of nearly three years, or, to be exact, two and seven-eighths years.

It is evident that the average wear of the infringing device was not less than three years, because Mr. Kinsey testifies (Rec. p.

167) that only 180 1-6 sets were cast, and even if every casting made had been put in up to the time of bringing suit (which is not likely) there are only fifty-two sets left to replace the sixty-five sets in the locomotives which used it for four years or over.

This screen, the infringing device, was used with a straight stack, and the affidavit of J. W. Sanford, Master Mechanic of the Pennsylvania Railroad (Rec. p. 297), shows that the average wear of such a straight stack is not less than four or five years, so that a locomotive equipped with a straight stack and the infringing device would certainly wear an average of at least three years without further expense.

(The diamond stack cone and netting.)

The affidavit of G. W. Stratton, Master Mechanic of the Pennsylvania Railroad at Altoona, offered by the defendant (Rec. p. 291), states:

"I find that a diamond stack will last on an average about "thirteen months before needing repairs; I find from a memo-"randum made by me in the year 1875 that the life of a cone in a "diamond stack ranges from eight months to thirty months, but "nine cases recorded ranged from eight to sixteen months; the "longer periods were exceptional."

"The average life of a wire netting in a diamond stack before "it requires renewing is about a year; some will run longer, some "shorter, depending somewhat on the exhaust used."

The affidavit of James W. Sanford, Master Mechanic at the Pennsylvania Railroad shops on the meadows, Jersey City, says of the straight stack formerly used on that road with a Smith Spark Arrester and referred to by Stratton in his affidavit: "The "average wear of such a straight stack is not less than four or "five years: I refer to a stack made of No. 10 iron; a diamond "stack made of the same iron cuts out rapidly from the cinders "deflected from the cone, and the average wear thereof is about "one year. The wire netting of a diamond stack would not wear "as long as the stack. It would cut out more rapidly than the "stack."

The evidence of William Osborne (Rec. p. 189), James Turner (p. 203) and Peter Tronson (p. 216) will show that a Diamond Stack will wear from a year to eighteen months and the wire screen from three to six months. These men were from the D., L. & W. R. R., and in their diamond stacks the wire screen was placed as in the last exhibit drawing in the record and not near the top of the stack as used by the defendant. (See third drawing from the end of the book.) The effect was that the netting in one case received the force of the most of the coals deflected by the cone, while in the other case the sides of the stack received the force.

The opinion of Mr. Justice Bradley (Rec. pp. 303–305) containing the account of profits realized by the defendant, certainly gives every consideration to the defendant that the evidence will warrant. It is computed on the basis of a diamond stack lasting an average of about two years and the wire screens a year or more.

The account thus made up is entirely from the defendant's own figures as to cost of stacks as given in the statements of cost of Diamond Stacks and Straight Stacks, &c., pages 308, 309 and 310 and cost of infringing grate, page 311. This was on the basis of cost of iron in 1889. J. W. Sanford (Rec. p. 297) says, Iron used in construction of stack was one-fifth less in 1889 than in 1879, and James A. Coe (Rec. p. 297) says that No. 10 sheet iron was more than 25 per cent. less in 1889 than the price from 1879 to 1882. On page 311 will be found an exhibit "Cost of Iron," from which it appears that from 1879–1883 No. 10 common iron was from 2 6-10 to 3 4-10 or an average of 3 cents, while in 1889 it was 2 15-100, or about 28 per cent. less. Consequently the addition of 25 per cent. was fully warranted by the evidence.

The following are the particulars of the accounting as stated by Mr. Justice Bradley :

The cost of a diamond stack including wire net and lift pipe, is shown to be $32.24 ; 128 stacks would have cost	$4,126 72
96 of these made prior to 1882, would have had to be renewed, costing	3,095 04
25 per cent. additional cost of iron cost in 1889, to wit, $4.58 each is	1,025 92
2 new sets of wire screens for the first 96 stacks and 1 new set, on the average, for the residue, viz., the 96 new sets and 32 others, 320 in all, at $4.40	1,408 00
Labor of taking down stacks and adjusting said 320 new screens, at 60 cents each, is	192 00
	$9,847 68

579 The cost of one straight stack with cast-iron grate and lift-pipe is	$24.14	
25 per cent. additional cost of iron, being $4.08 for each stack		
	$28.22	
128 straight stacks at $28.22 is		3,612 16
Showing that the cost to the defendant of diamond stacks and wire net during the period of infringement would have been		9,847 68
Whereas the cost of the straight stacks and cast-iron grates was only		3,612 16
Making a profit of		$6,235 52

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